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Deeds speak
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Julius Thomas

Foreman of Core-room

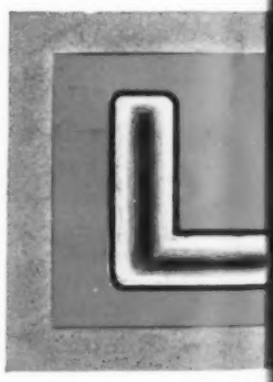
PLANT NO. 2

Light Castings

Quincy Ave.

38 Years Experience

"Maybe I could get along without Linoil but I would hate to try it."



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Keeping United States Neutral Is First Duty of Leaders

WAR in Europe, completing the third week as this is written, presents serious problems and places immense responsibilities upon leaders in every ramification of American life. First and foremost is the fundamental necessity of keeping the United States completely neutral in the face of the tragedy abroad. Twenty-two years ago this country entered a "war to end all wars" with the noble purpose of "making the world safe for democracy." The tremendous sacrifice in men and the enormous expenditures of money and natural resources failed to accomplish any part of that aim. The nation still suffers from the effect of that indulgence.

The vast majority of present day leaders in politics, business and industry served this country in some capacity during the World war. Surely the experience gained during those hectic days should be used to excellent advantage now. Decisions of national policy and of the actions governing all business and industry must be arrived at with calmness, unselfishness and complete understanding.

The following statement by E. L. Shaner, president, Penton Publishing Co., in a recent issue of *Daily Metal Trade,* is worthy of serious consideration:

Beware of the slap-dash, impetuous leader in government, business or elsewhere who scoffs at the lessons of history.

New methods may be in order. They may be better than old methods. If so, they are better because they take into account and avoid the mistakes of old.

Trend Continues Upward

FOLLOWING the summer which witnessed a steady improvement generally in the production of castings, the foundry industry now is faced with the uncertainties occasioned by the European war. During September, production in many shops continued the steady increase, in some it mounted rapidly and in others it declined. In the industry as a whole, the gains more than offset the losses, and opinion of leaders in the industry seem to point to a further improvement in October.

Low inventories in foundry yards has resulted in a buying rush of considerable magnitude. Prices asked for iron and steel scrap have surged upward rapidly. Pig iron advanced $2 a ton around midmonth and prices of some nonferrous metals have increased. Manufacturers of foundry equipment report improvement in orders and a marked increase in interest.

While the situation in 1939 differs markedly from that in 1914, a brief review of trends 25 years ago should be interesting. Foundry operations were at an extremely low point during the first 7 months of 1914, with many plants shut down for extended periods during the summer. In September, THE FOUNDRY said: "Business conditions generally were unsettled throughout the month of August as a result of the European war and many purchases are being deferred until the effect of this world-wide trade disturbance is more clearly defined. The ultimate outcome foreshadows unparalleled prosperity for American industries and with the re-establishment of trade routes to Europe and South America, our export trade should grow tremendously in volume." But operations continued to decline and it was not until February, 1915 that this publication reported "Evidences that improvement has set in continue to multiply." That improvement was slow to materialize and it was October before the announcement was made that "Operations in the castings industry now may be considered normal." By December, 17 months after the outbreak of the war, THE FOUNDRY reported "Foundry operations in all branches of the industry are being carried on under high pressure, the avalanche of orders being greatly in excess of producing capacity." That business in the main did not result from orders for war materials, but for goods to be used at home, such as stoves, farm implements, automobiles, railroad castings, etc. Today, improvement in this "home demand" should be a good barometer in judging future trends.

Perhaps the greatest problem facing foundrymen under present circumstances pertains to equipment. Much equipment now in use is obsolete or entirely inadequate to meet a substantial increase in orders for castings. This fact was demonstrated clearly during the spurt of 1936-37. During the past year or so much interest has been shown in equipment and considerable preliminary work on proposed installations has been undertaken by equipment manufacturers. For numerous reasons, orders have been held back. These projects soon must be given further consideration. If business shows the expected upward swing, it may be far more difficult to secure delivery on orders for equipment than on castings, as difficult as the latter may become.

Frank G. Steinebach
Editor

Melts ALUMINUM

By F. FORREST STRETMATER
Foundry Metallurgist
Servel Inc., Evansville, Ind.

SINCE 1500 pounds of aluminum per hour was required for 16 hours each day for the production of the evaporator castings, flue pipe connections and other miscellaneous aluminum castings essential to the manufacture of the Servel Electrolux refrigerator, the aluminum melting problem is one chiefly of production.

Approximately 90 per cent of aluminum is cast into the evaporator castings which are made in both green and dry sand molds. The evaporator coils made of seamless steel tubing, are assembled in oil-sand cores as shown in Fig. 5 and then are placed as the case may be in green sand molds as in Fig. 4 or mudded at the joints and clamped together as depicted in Fig. 6. Eight and 15 oil-sand cores are required to assemble the smallest and largest evaporator molds respectively. The coils are galvanized to promote a good bond between coil and surrounding aluminum.

A few minutes before assembling the molds the zinc coated coils are heated to a temperature from 400 to 500 degrees Fahr. as they advance along an overhead conveyor by a group of gas torches. Application of heat at that point is a precautionary measure to insure a clean, dry coil in the mold inasmuch as there is a

Fig. 1—(Above)—Pouring an evaporator casting. Fig. 2—(Left)—After the molds are shaken out, the cores are removed with an air hammer. Fig. 3—(Right)—The 6-ton furnace with the burner and blower at the left. In the background may be seen the zinc-coated steel coils on an overhead conveyor. Assembled and clamped molds are at extreme right

M IN REVERBERATORY FURNACE

soap test operation on the coils immediately following galvanizing.

Entering the mold, the metal, approximately 3/32 to 5/32-inch thick, flows around the steel evaporator refrigerating coil and forms the ice and chilling tray compartments known as the evaporator. After finishing, the evaporator castings weigh from 13 to 28 pounds. Chief requirements of the metal are that it be poured at high temperatures from 1500 to 1700 degrees Fahr., possess sufficient fluidity to run the castings, yield upon solidification a dense structure of high thermal conductivity that is odorless and free from discoloration, and possess reasonable strength.

The usual gas-fired, cast iron pots of 700 pounds capacity first were used for melting the metal. The high fuel and labor costs, and iron pick-up by the aluminum prompted the company's engineers to conceive plans for a single, brick-lined melting furnace centrally located to replace all the iron pots. Accordingly, plans were drawn for a 6-ton, gas-fired, reverberatory furnace.

Build Aluminum Melting Furnace

A steel shell 11 feet 6 inches x 6 feet 4 inches x 8 feet 8 inches is supported by angles, I-beams and tie rods (for expansion). For the bottom 3 to 9 inches of aluminite cement is laid on a steel plate. On the cement a single course of 9-inch straights and keys of No. 1 firebrick is laid.

An air space 10 inches high is allowed between the floor and the steel plate for ventilation. The roof and bottom are arched from end to end as well as from side to side. The walls are constructed of two courses of brick with 9 inches of No. 1 firebrick forming the inside course backed by 4½ inches of insulation brick. Nine-inch straights and wedges of No. 1 firebrick formed the roof.

Openings in each of the two sides 30 x 24 inches covered by vertical sliding doors 36 x 30 inches are provided for charging and skimming. In one end of the furnace at the top the flue opening of 144 square inches in area is located. The chimney is a brick structure built on the floor extending up through the foundry roof. At the other end, opposite the flue, two tuyeres are located through which the gas-air mixture enters the furnace. The tuyeres are funnel shaped of 8 inches mean diameter 20 inches apart on the center lines.

Powered by a one horsepower motor a premix burner and blower supplies the gas-air mixture to the furnace. The gas line is equipped with a gas pressure regulator and a magnetic shut-off valve that cuts off the gas when the blower stops. The tap hole is incorporated in a specially constructed brick placed in the middle of one side of the furnace at hearth level so as to provide complete draining.

Under the old arrangement 7 cast iron pots in continuous operation were required to meet production. One man was kept busy charging the pots, adjusting the heat, checking temperatures, fluxing, skimming and handling the tilting mechanism for pouring the contents of the pots. Two other men were required part time to handle ladles for pouring the castings. Close supervision of all the pots and their charges at all times was impossible. Gas consumption was high as was oxidation loss and pot replacement cost.

With the reverberatory furnace 90 per cent of the labor incidental to charging and pouring is handled by one man. Closer supervision is maintained over the charging, melting and pouring operations. Maintenance costs are about the same but gas consumption has been reduced 27 per cent. The average operating melt-

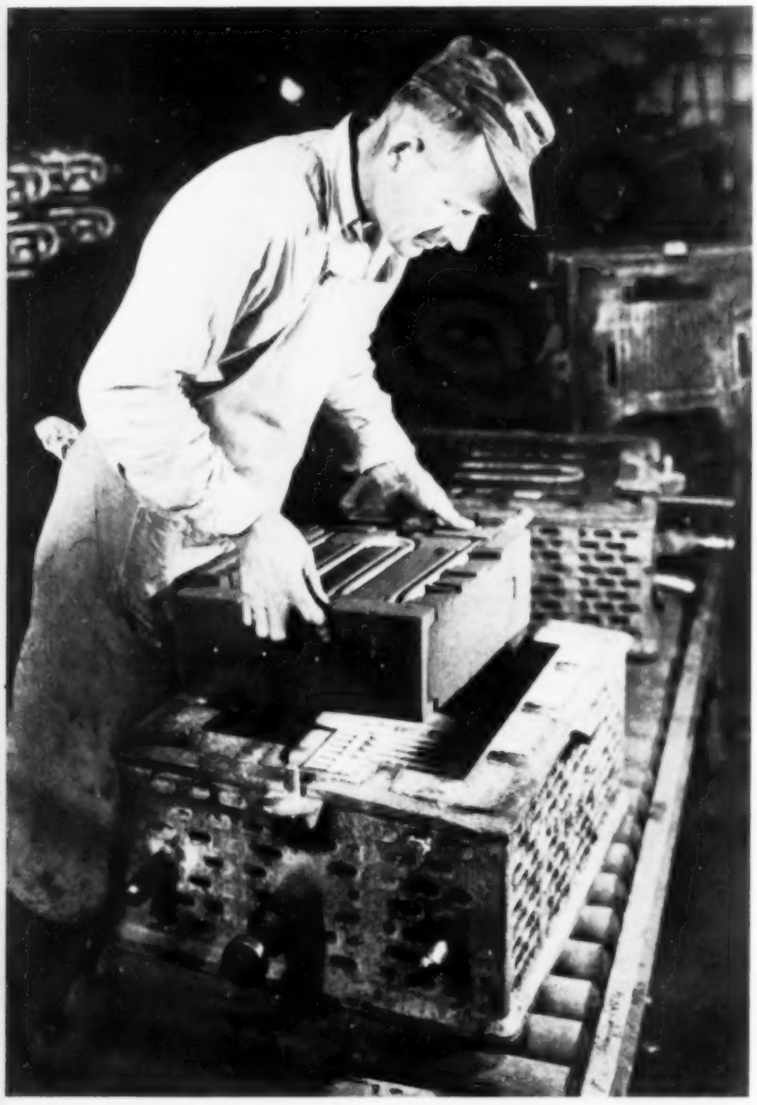
ing efficiency of the furnace is 221,000 B.t.u. per 100 pounds of aluminum charged and poured.

Oxidation losses amount to approximately 0.5 per cent. Iron pick-up by the aluminum during melting has been reduced to zero and the metal that later becomes castings is more uniform in all respects. No serious break downs or operating interruptions entailing loss of material or labor have been experienced during the 2 years the furnace has been in operation.

When the furnace tender arrives on the job in the morning a furnace full of metal at or near the proper pouring temperature is awaiting him. This is provided by a member of the night crew who, under the supervision of the night foreman, charges the furnace and adjusts the gas setting so as to have the metal ready to pour when it is needed. The furnace is provided with two small holes through the wall above the metal level, through which a thermocouple within a protective tube may be inserted into the molten metal.

The metal charge consists of 75 per cent pig aluminum and 25 per cent return scrap. The analysis of the pig is aluminum 89.50 per cent, silicon 1.50 per cent, copper 7.00 per cent, zinc 1.00 per cent and iron 1.00 per cent. Analysis of the scrap is the same since it is our own consisting of gates, sprues and riddled floor sweepings. The scrap is placed in the furnace first and allowed to melt down before adding the chunkier pig. For each 1000 pounds of metal charged 1 pound of a proprietary aluminum flux composed of chlorides and fluorides is added.

Fig. 4—Placing assembled core and coil in green sand mold preparatory to pouring



The first duty of the furnace tender in the morning is to check the temperature of the aluminum and make any necessary adjustments to the gas flame. Just before pouring is begun, the metal is fluxed again by scattering over the surface of the metal one-fourth pound of flux per 1000 pounds of aluminum. This is followed by stirring and skimming. The dross is placed in a wheelbarrow with a perforated bed which permits any adhering metal to drain through.

At one time it was thought necessary to leave a small amount of dross floating on the molten aluminum to prevent oxidation. By properly controlling the furnace atmosphere that precaution becomes unnecessary. A neutral to slightly reducing atmosphere is maintained. The adjustment screws on the premix burner are regulated to admit the proper ratio of air to gas to yield that condition.

The furnace is tapped by picking out the oil-sand plug core placed in the tap hole at the conclusion of the previous day's run. First metal out is pigged after being used to heat the pouring ladles. Temperature of the aluminum is measured in a pouring ladle by a thermocouple. If found to be in the proper pouring range, the metal is poured into the molds as they come down a conveyor in front of the furnace.

Furnace Tender Pours Metal

By properly adjusting the size of the tap hole and the flow of metal with a tapered steel bar one furnace tender can handle two 23-pound capacity, hand ladles and pour 1000 pounds of aluminum per hour along with his other duties. One ladle is permitted to fill while pouring with the other.

When the available molds have been poured, the furnace tender plugs the tap hole with the steel bar or fireclay bod, adjusts the gas supply for maintaining the proper temperature, and, if another shift is to follow his, adds aluminum to the furnace equal in amount to that just drawn out. Contents of the furnace then must be stirred before tapping again. During the last or only shift the volume of metal within the furnace is permitted to decrease and is replenished later by the night man. After the last ladle of the day has been drawn, the previously mentioned oil-sand core is forced into the tap hole applied on the end of a bod stick by a bod of fireclay. A recent step-up in production now requires that one man devote his entire time to pouring, leaving the job of charging the furnace to some one else. Under that arrangement he can pour 2000 pounds of aluminum per hour.

Each week-end the furnace is drained of metal, cooled and inspected, and repaired. Slag and dross is chipped from the walls, and any necessary repairs to the lining are made. To protect the lining from attack by the molten aluminum and slag, it is sprayed with a white wash solution.

We use a lime sludge, a waste product from our acetylene production. The (*Please turn to page* 88)

PRODUCING ALUMINUM BRONZE *Castings*

By N. K. B. PATCH

TWO methods of producing aluminum bronze are in vogue, each of which has its advocates. The first is to buy aluminum bronze in the form of ingot metal from manufacturers who have the necessary laboratory control and modern equipment to insure a uniform product conforming to the analysis desired.

There is much to be said in favor of this practice insofar as the preparation of the metal itself is concerned. Laboratory control of the process of alloying the necessary ingredients in aluminum bronze is absolutely essential. Sound metallurgical practice must be one of the major ingredients if the alloy is to be up to standard and give satisfactory service under commercial conditions.

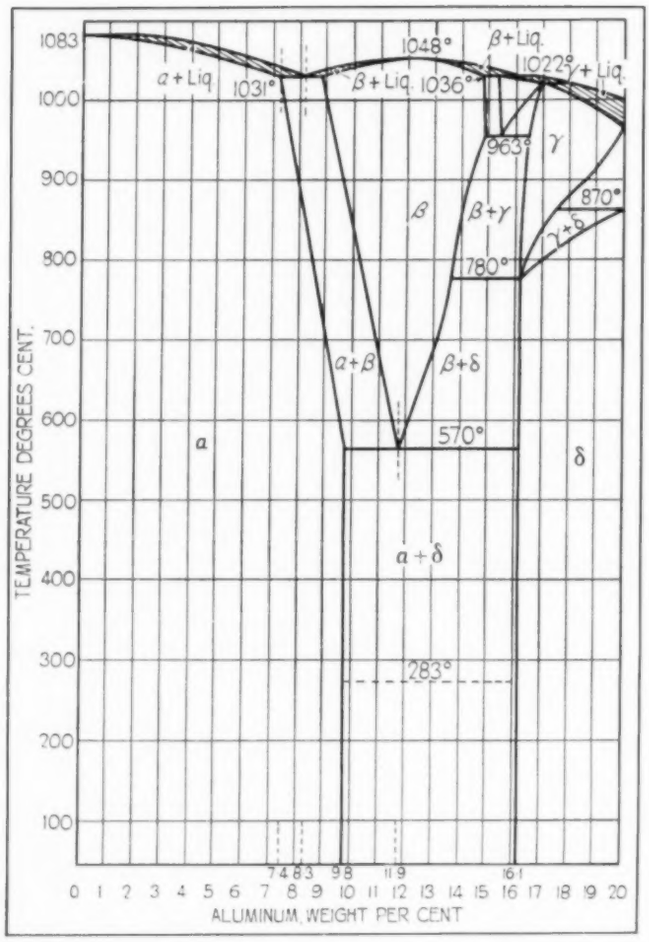
Melt Aluminum Bronze Mixture

The second method is as follows: Where crucible melting is to be adopted, the crucible is charged with copper and some aluminum, as well as iron. Iron usually is charged in the form of clippings of sheet iron or tin plate. That material is light, does not pack easily, and therefore, forms a cushion in the bottom of the crucible upon which copper and aluminum ingots rest. As the latter elements melt, they dissolve the sheet iron and when that part of the charge is melted entirely, the bath is stirred well. Stirring with an up and down motion insures the mixing of the aluminum into the bath since aluminum being much lighter than the rest of the bath, tends to float on the surface.

The remainder of aluminum, to make up the complete charge, then is added and when all is in a good fluid condition, a thorough up and down stirring again must be applied so that all the elements may be mixed thoroughly. Then as soon as the metal is quiet and thoroughly fluid, it is poured into ingots. These ingots should be well mixed with ingots from other charges. From that mixture the ingots for the remelting of any desired quantity of aluminum bronze for the production of castings should be drawn.

If aluminum bronze is produced in some other type of furnace such as an open flame reverberatory or an electric furnace, the charging is much the same as with crucibles, and the rotation of the different steps must be exactly the same. Atmosphere in the furnace in which aluminum bronze is melted must be definitely on the oxidizing side so that there are no underburnt gases present that may be dissolved by the bath of molten metal or the metal in process of becoming molten.

The series of compositions known as aluminum bronze is extremely sensitive to gassing and that can only occur when underburnt gases are present. Completely burnt gases are not soluble in molten aluminum bronze. The problem of avoiding gassing of aluminum bronze has been discussed time and again, but it cannot be emphasized too strongly as one of the essential and important factors in the production of good metal from which to make good castings. Even when this series of compositions is melted or produced in an elec-



Copper end of copper-aluminum equilibrium diagram based on Stockdale's work. From Aluminum Bronze, published by Copper Development association, London

tric furnace, the burning electrodes will tend to produce underburnt gases unless there is a sufficient supply of oxygen made available to insure complete combustion of these gases as they are formed by the combustion of the electrodes.

In making castings of aluminum bronze there are a number of vital precautions that must be observed if sound satisfactory castings are to be produced. First, the metal must be melted in an oxidizing atmosphere so that there is absolutely no chance for the presence of underburnt gases. Gassed aluminum bronze will invariably produce bad castings, and therefore, if there is any suspicion that the metal during melting has been gassed, it is much better practice to pour this metal into ingots and remelt it, than to pour it into molds which have entailed molding and labor costs in their production thus producing bad castings.

Table I

Influence of Temperature

Quenching temperature deg. cent.	Tensile strength lb. sq. in.	Elongation per cent in 2 in.	Brinell hardness number
500	71,680	7	175
600	75,936	26	146
700	73,696	18	158
800	85,792	6	210
900	97,216	4	255

Second, all molds must be rammed carefully so that no hard spots or excessively wet spots are present that would cause blows or agitation of the metal during its entrance into the mold or during solidification. Whenever aluminum bronze is agitated by bubbling gases, etc., the aluminum content is oxidized and forms aluminum oxide scum which is the source of most annoying defects whenever it is produced by the agitation of the metal within the mold.

Third, gating of aluminum bronze castings must be such that the metal enters the mold without agitation of any kind, as the spraying of the metal into the mold will invariably produce aluminum oxide scum and its consequent defects in the casting.

It will be found desirable to have gates of ample size to permit a free, quiet entrance of the metal to the mold. However, the gate must not be as large as to drain the sprues or allow the metal coming down through the sprue to suck air with it as it passes down. Result of that suction is the formation of dross on the surface of the metal passing down in the sprue which invariably will be carried into the mold forming seams and defective spots that can only be removed in some instances by the destruction of the casting itself.

Pour Metal in Steady Stream

A sprue that is kept full and poured by a steady stream will give best results from the standpoint of pouring practice. A gate that permits the metal to flow quietly and yet rapidly enough to fill the mold without requiring too long a time for pouring will give best results in almost every instance.

Where irregular shaped castings are to be made it may be necessary in a few instances to gate at two or more points to avoid the flowing of the metal over ridges as it enters the mold and the consequent breaking of the stream. Breaking the stream invariably results in formation of dross. Where two or more gates are used, care must be taken to have the size such that the two or more streams of metal will maintain the fluidity of the metal sufficiently that the streams will unite readily the moment they come in contact. If they do not unite but on the contrary form a film between them, this film will be a defect in the casting and cause rejections. Cure for that is to change the size of the gates and possibly increase the pouring temperature slightly. Every mold for aluminum bronze castings must be free venting so that there is no agitation whatsoever of the metal during this pouring process.

Fourth, risers must be of adequate size to insure proper feeding of all castings made in aluminum bronze. The gate connecting the riser with the casting must be of such a size that there is no chance it will freeze prior to the freezing of the casting. The riser in turn must be large enough so that it will be the last to freeze, thus insuring a quantity of fluid metal being ever available to flow into the casting as long as the casting is shrinking and demanding additional metal with which to be fed.

Height of the riser must be such that the weight of metal above the casting will be sufficient to force fluid metal from the riser (*Please turn to page* 90)

COMPLETES SUCCESSFUL

Malleable Iron Training Course AT RENNSELAER

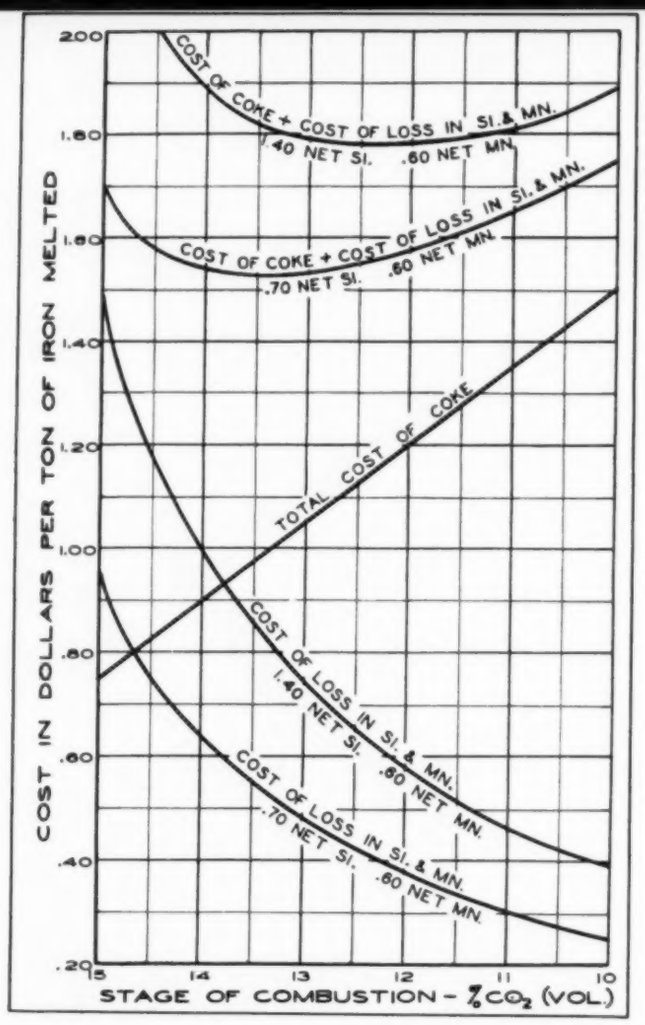
AN INTENSIVE eight week technical training course at Rennselaer Polytechnic institute, Troy, N. Y., sponsored by the Malleable Founder's society, was completed Aug. 18. The course was open only to employes of society members and had two main objectives: Product betterment in the industry and to provide young men in the industry opportunity to become acquainted with the more technical phases in the production of malleable iron. According to authorities at the institute and to those participating in the course, the undertaking was highly successful.

Rennselaer Polytechnic institute was selected by the society because of the complete and modern laboratories and equipment available and the progress made in metallurgy. The course was under the direct supervision of Dr. M. A. Hunter, head of the department of metallurgy. For lectures, seminars and laboratory work, Scott McKay, professor of metallurgical engineering; Augustus Jones, assistant professor metallurgical engineering and Dr. Harris M. Sullivan, instructor in metallurgical engineering were given full time assignments. Enrique Touceda, emeritus professor of metallurgy at Rennselaer and consulting engineer to the Malleable Founder's society gave a series of ten lectures. James H. Lansing, shop practice engineer of the society, held seminars and lectured on the more detailed matters of shop practice, annealing, etc.

Instruction in the course had to be handled in a manner suitable for a group with widely varied educational background. Although none of those who enrolled had less than formal high school education, many of the men were holders of college degrees. While it was necessary to present a considerable amount of theory, it was a base for an explanation of the commercial practice of specific processes in the ferrous metal industry. Lectures and seminars were supported and reinforced by a great deal of laboratory work and by visits to manufacturing plants.

In the first few weeks of the course subjects were selected to give a sound knowledge of the elementary chemistry and metallurgy of iron and steel making processes. Considerable time was devoted to the metallography of the different ferrous products and the changes in structure that occur through heat treatment. Mechanical and chemical testing were covered by lectures and individual work in the laboratories. Other subjects briefly covered early in the course included x-ray examination, (*Please turn to page* 96)

In addition to the classes and lectures the students were given the opportunity to carry on actual tests on the different pieces of apparatus in the chemical and physical laboratory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COST OF COKE + COST OF LOSS IN SI. & MN.
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15 14 13 12 11 10
STAGE OF COMBUSTION - %CO2 (VOL.)

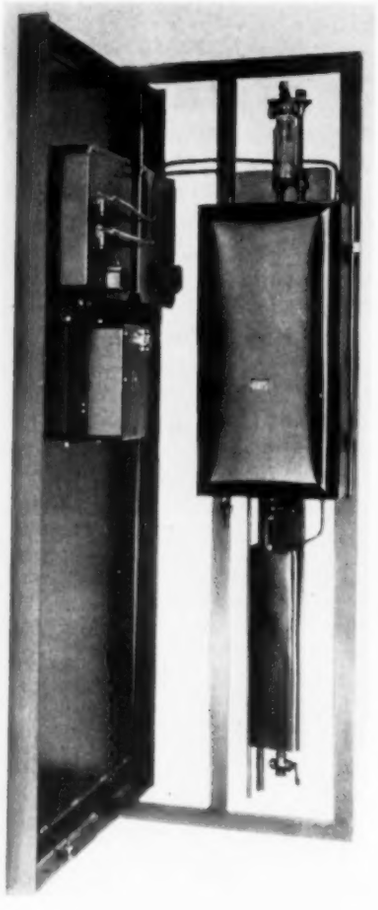
FIRST cupola on record was built by Reaumur in France about 1720 and the first in the United States in 1820. The cupola since then has undergone many changes and its auxiliary equipment has been improved greatly. However, it is only within recent years that attempts have been made to control accurately the quantity of air so as to maintain a constant stage of combustion within the fusion zone.

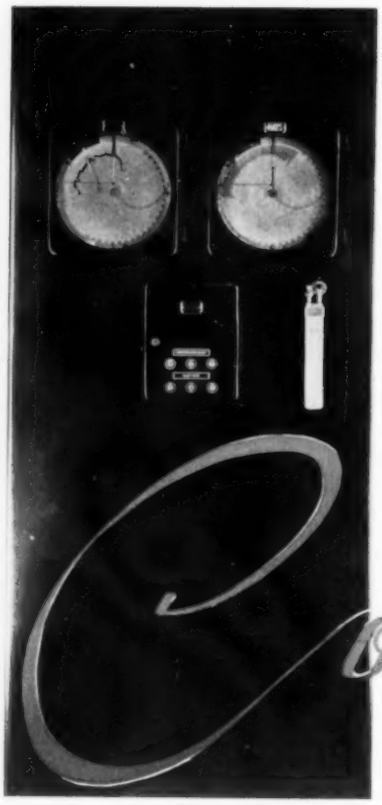
It is quite evident that the loss of elements, economy of operation and potential qualities of the iron melted are definitely a function of the atmosphere existing in the melting zone of the cupola. Unfortunately, it is impossible to see what actually is happening within the cupola and as a consequence, regulation of the process becomes difficult because corrective measures cannot be taken immediately.

To accomplish greatest economy and maximum uniformity of iron the following factors require careful regulation: (1) Ratio of coke to quantity of iron melted. (2) Ratio of air to coke. (3) Rate of combustion of the coke. (4) Temperature of combustion. (5) Efficiency of combustion. (6) Efficiency of heat transfer to the iron. (7) Losses of silicon and manganese, etc.

Ratio of coke to iron melted can be regulated easily.

Fig. 1 (Upper left)—Curves showing stage of combustion versus melting cost. Fig. 2 (Lower left)—Back of the panel shown in illustration at right. Fig. 3 (Below)—Front of panel containing complete instruments installed in the foundry





Combustion

By S. C. MASSARI
Metallurgist
Association of Manufacturers
of Chilled Car Wheels, Chicago

If the quantity of air used in burning this coke is controlled so as to produce a constant stage of combustion at all times, the other factors enumerated will be regulated almost automatically.

As is quite usual, development of a control method had a modest beginning. Before practical conclusions could be drawn or extensive plans initiated, the simplest and least costly methods were utilized. The initial gas analyses were made with a conventional portable hand operated orsat gas analyzer. Samples of the effluent gases issuing from the top of the cupola were obtained by inserting a length of ⅛ inch pipe into the cupola charge and permitting it, when desired, to descend with the charges so as to obtain gas samples at various depths below the charging level.

Samples also were taken at different points across the diameter and at various points around the circumference of the cupola. In this manner the relation between the composition of the gases at various points relative to the location of the tuyeres, to the charging doors, and to the position at which the blast main entered the wind box were obtained.

Gas Analyses Vary Considerably

Gas analyses within a given cupola vary considerably depending upon the time and location from which the sample is procured, but in each case they bear a definite relation to the process. Basic chemistry of the operation predicates that these differences should be expected and that each analysis is in reality an index of conditions within the cupola at that location. In other words, it becomes necessary to interpret each analysis in terms of the location from which it was extracted.

These surveys disclosed a surprising similarity between the composition of the gases in a cupola and those present in a blast furnace or gas producer. When in contact with an excess of coke the composition of the gases is influenced primarily by temperature, the carbon dioxide—carbon monoxide gas mixture being richer in carbon monoxide as the temperature increases. This equilibrium is a reversible reaction and is defined by the following chemical equation:

$$CO_2 + C \rightleftarrows 2CO$$

Rapidity with which equilibrium is attained under a given set of conditions is largely a function of the characteristics of the coke, namely, whether it is dense or soft and open. The basic combustion relationships justify a lower carbon dioxide concentraton close to the fusion zone where the highest temperatures exist and a greater amount in the proximity of the charging doors.

It would be most valuable to have a continuous knowledge of the composition of the gases passing through the cupola at a number of locations, but practically this is not possible. The problem resolves itself to sampling the gases without interruption and obtaining a sample which will reflect in a relative manner the conditions actually existing within the fusion zone.

Sampling Tubes Might Fuse

Theoretically, the most logical location to withdraw the gas sample would be within the combustion zone. At that point the sampling tube either would become plugged with slag or completely fuse shut. An extended series of analyses indicated that a sample taken within 3 feet of the charges would be indicative of the equilibrium conditions within the combustion zone.

In other words, as the carbon dioxide—carbon monoxide ratio changed within the combustion zone, the change would be reflected consistently in the composition of the gases near the charging door level.

For reasons already enumerated, 4 gas sampling tubes were located permanently at 90-degree intervals around the circumference of the cupola and about 3 feet below the normal stock level. Holes were cut through the cupola shell and 1-inch iron pipe inserted into these holes to within ½-inch of the face of the lining. Installed as described, the tubes are protected from mechanical abuse and excessive temperatures.

By utilizing four tubes the gas sample is a composite one, representative of the average combustion

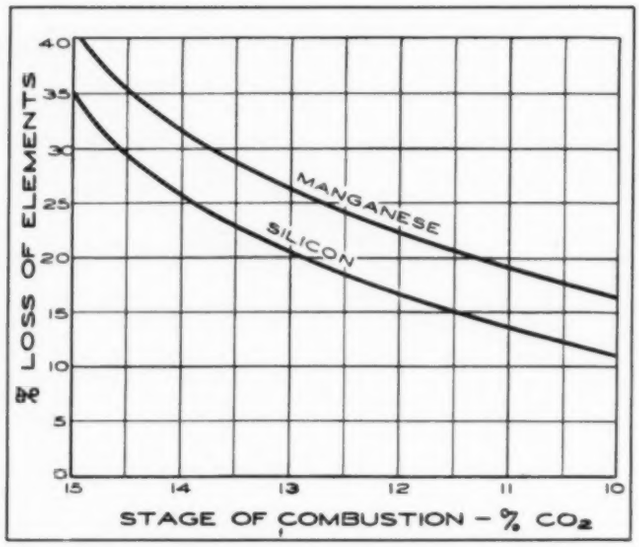


Fig. 4—Stage of combustion versus element loss

over the entire cross-section of the cupola. The four individual pipes then are connected together with equal lengths of pipe so that a uniform suction is exerted on each of the sampling tubes. Wherever a turn occurs in the pipe system it is essential to use a cross instead of a pipe elbow. At the end of each day's operation the plugs can be removed from the blind ends of the cross and all fume removed by using a steel brush followed by blowing out with a jet of compressed air.

The composite gas sample is passed through two filters to remove all fume, which, if permitted to enter the analyzer, soon would render it inoperative. From the filters the gas is conducted through ½-inch pipe to the carbon dioxide recording analyzer. The analyzer contains a water operated injector which serves to aspirate the sample of gas from the cupola. The same water, after passing through the injector, also serves to operate the analyzer mechanism.

Composition of the effluent gases, with that of the metal which issues from the cupola spout afford a means for obtaining a relation between loss of silicon and manganese during the process of melting and various stages of combustion. Fig. 4 graphically shows that relation. These curves show a definite relationship between the stage of combustion and the loss of these elements.

It thus is apparent that efficiency of combustion, in part, is restricted by losses of silicon and manganese which are more costly than the coke which might be saved. Relation between efficiency of combustion and the total cost of coke, silicon and manganese is portrayed clearly in Fig. 1. Maximum economy is attained when the carbon dioxide concentration in the effluent gases is maintained between 13 and 14 per cent when melting a low silicon iron and between 11½ and 12½ per cent when a moderately high silicon iron is being produced.

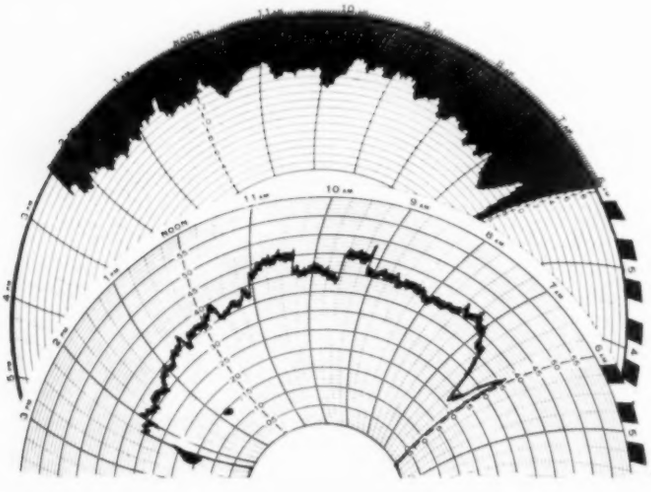
Combustion Must Be Controlled

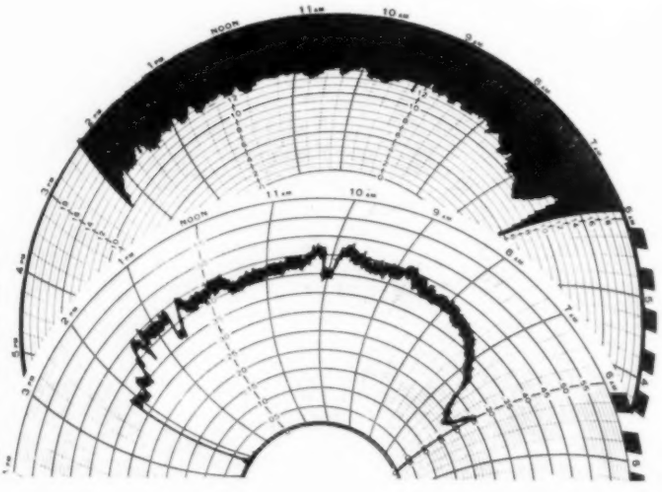
A definite trend also becomes apparent if the percentage of carbon dioxide is evaluated against the total carbon content of iron melted. For example, during a test heat, when the carbon dioxide was 11½ per cent the total carbon in the iron was 3.75 per cent, while it was only 3.45 per cent when the effluent gases contained 15 per cent carbon dioxide. Although more difficult to accomplish, these data direct attention to the necessity for carefully controlled combustion if low total carbon iron is to be produced consistently in the cupola.

As also might be anticipated, coke ratio and analysis of the effluent gases are related closely, being practically a straight line function. In a given cupola, when operating with a coke ratio of 14½ pounds of iron melted per pound of coke consumed the effluent gases contained approximately 13½ per cent carbon dioxide. When the same cupola was operated with a coke ratio of only 10 to 1, the carbon dioxide was reduced to 10 per cent. That gives further evidence that controlled combustion can be a definite source of fuel economy which will soon liquidate the initial cost of an automatic control capable of maintaining the desired stage of combustion.

Uniformity of combustion (*Please turn to page* 98)

Fig. 5 (Below)—Simultaneous charts from carbon dioxide and air volume recorders during manually controlled heat. Fig. 6 (Right)—Sample records obtained during a typical, automatically controlled heat





A LITTLE KNOWLEDGE

Is A Dangerous Thing

By JOHN HOWE HALL
Philadelphia

IN A PAPER by the late George Batty, *Transactions* of the American Foundrymen's association, Vol. XXXIX, 1931, page 861, referring to the low ductility resulting from the addition of aluminum commonly added to cure pin hole trouble the statement appears: "It is affirmed that the problem is one of preventing the reoxidation of the metal, because we know that the use of a powerful deoxidizer such as aluminum results in the formation of deoxidation products which promote embrittlement. Further, it would seem that the liability to embrittlement is related to the amount of inclusions formed by the combination of the deoxidizer with an immigrant mold gas." He then goes on to develop his theory that aluminum embrittlement is caused by the formation of Al_2O_3 in the steel by the reaction between aluminum and gases, particularly water vapor from improperly prepared green sand molds, that force their way into the steel. Given only the correct sand conditions, Batty claimed the gas would not penetrate into the castings, and aluminum embrittlement virtually would be unknown. This happy prophecy, proved to be largely wide of the mark, as was later conclusively demonstrated by Sims and Lillieqvist in their 1932 A.I.M.E. paper referred to in a preceding instalment.

Compares Two Types of Steel

In that same year, F. A. Melmoth feeling toward an explanation of the problem[3], made careful comparisons between acid open hearth and acid electric steel of identical composition and pointed out the *abnormality* of certain heats of the latter. In the paper he said his main object was to draw attention to the undoubted fact of occasional abnormality in electric steel for castings. He believed that this tendency is controllable along the lines suggested, and also considered that by no means had the possibilities of improving our castings directly through the steel been exhausted. He stated the indications show most distinctly that although chemically identical, open hearth and electric steels are not necessarily identical in constitution. His inclination was to place the cause of this as the effect of the existence of nonmetallics in the electric steel, unless carefully produced. This nonmetallic material is not necessarily slag in the generally accepted sense of the word, but is more likely to be silica particles of an ultra-microscopic nature.

Low Ductility Cause Not Known

In discussing that paper, Batty said "We have suggested to each other (the idea is not at all novel) that this peculiarity of behavior exhibited by some of these acid electric steels may be due to the influence of submicroscopic nonmetallic particles as well as the particles of nonmetallics that are visible under the microscope." The present author confesses that he was thinking along the same line at or about that time, and engaged the interest of Francis F. Lucas in the work on the low ductility problem, without any more luck than attended the efforts of other investigators to lay the trouble to the submicroscopic. Still, the cause of low ductility, and the cure for that troublesome phenomenon, escaped the searchers.

In the 1932 paper referred to previously, Sims and Lillieqvist showed that low ductility in electric cast steel invariably was associated with a certain arrangement of the nonmetallics, especially the manganese sulphide, present in the metal in particles of such size as to be seen clearly under low magnifications. When no aluminum was added to the steel, they found the inclusions globular in shape, and not harmful to the ductility. In the presence of small amount of aluminum, the sulphides precipitate in a eutectic form, making a network in the steel, and giving rise to low ductility. Presence of iron oxide in the steel was

shown to favor the harmless type of inclusions, and the interesting conclusion was reached that variations in *quantity* of inclusions are without influence, provided only that the shape and distribution of the inclusions is the right one. Alumina was definitely absolved of the guilt of causing the troublesome low ductility.

The conclusion that the presence of iron oxide in proper amounts leads to the harmless type of inclusion, of course at once brings to mind the findings of Batty and Melmoth in working with basic electric steel in England. Over-reduced steel is not a good material to pour into castings, and that a practice in which the slag is kept brown and slightly oxidizing to the end, is by far the best one for the production of steel castings with basic electric steel.

One of the startling pieces of evidence in the Sims and Lillieqvist paper was the proof that a heat melted with four times the usual amount of iron ore, gave sound tests with good ductility even though aluminum was added to the ladle, while a heat of clean scrap, melted under a slag practically free from iron oxide, treated with ferrosilicon and ferromanganese in the furnace, and a little aluminum in the ladle, was so gassy and wild that no test bars could be obtained. This demonstration that deoxidizing conditions throughout an electric furnace melt do not give quiet steel, while severe oxidation may do so when properly controlled, effectively dispelled the idea that freedom from oxidation alone is a panacea in steel making.

Oxygen Decreases Solvent Power

Sims and Lillieqvist in that historic contribution further demonstrated that the inclusions in all probability are held in solution in the liquid steel, and that their shape and form depend upon how late in the solidification of the metal they come out of solution. A high oxygen content decreases the solvent power of the steel for these nonmetallics. They precipitate out of solution in the early stages of solidification and take the globular, harmless form, while in the more thoroughly deoxidized metal, which has higher solvent power, they are held in solution till near the end of solidification, and then precipitate in the harmful net work or eutectic form.

Later, in the 1934 symposium of the American Foundrymen's association on defects in steel castings[1], Sims discussed the mechanism of the formation of pinholes, and again pointed out that acid electric steel melted *flat*, with high residual silicon and made without *boiling*, invariably is a gassy steel, and in extreme cases even large amounts of aluminum will not make it sound. He stressed the necessity of vigorous boiling under an oxidizing slag, to reduce the gas content of the metal. Hydrogen and nitrogen held in solution in the steel and evolved during solidification, he considered the chief source of pinholes in castings, together with water vapor formed by reaction between dissolved hydrogen and oxygen, as well as *CO* due to oxidation of carbon by dissolved oxygen. The water vapor and the *CO*, of course, are evolved during solidification and their formation also encourages the liberation of dissolved nitrogen. To prevent this reaction between dissolved oxygen, and the hydrogen and carbon, the oxygen content of the finished steel should be brought to very low figures.

Formation throughout the steel in the furnace of rising bubbles of *CO* that follows strongly oxidizing conditions and results in a vigorous boil, Sims points out, enables the other dissolved gases to fall out of solution and rise out of the bath.

To promote low gas content in the steel, Sims advocated (1) long vigorous boil, (2) thorough oxidation, (3) low residual silicon and manganese, which are necessary if thorough oxidation is to be secured, (4) moderate metal temperature, (5) no increase in temperature after deoxidation, (6) deoxidation late in the heat.

To assist in retaining the remanent gases in solution, he showed the necessity of (1) thorough deoxidation and (2) minimum exposure after deoxidation. While recognizing the fact that water vapor coming from a damp spout or ladle lining, or even from poorly prepared green sand molds, may result in pinholes, he emphasized strongly the importance of good steel making practice in the production of sound castings.

At a regional meeting of the American Foundrymen's association in the fall of 1937, Sims presented a preliminary program for the prevention of pinholes and of aluminum embrittlement in acid electric steel castings. This was presented later in full before the May, 1938, session of that body, in Cleveland. In that paper[2], references are given to the extended work of the other investigators through whose efforts ammunition was prepared to slay the aluminum embrittlement dragon. A program for the production of acid electric furnace steel is set forth, and data are presented that lead to the conclusion that at long last the fight has been brought to a successful conclusion. In the full discussion accompanying the paper, confirmatory data are presented by other experimenters. A paper by Gagnebin[3] confirms the main points of the Sims thesis, and proposes a closely similar method of preventing aluminum embrittlement.

Study Reasons for Embrittlement

Briefly, these investigators conclude that the cure for sporadic embrittlement due to small additions of aluminum to acid electric steel, is more aluminum. One is reminded of the old saw, a hair from the dog that bit you, as a cure for dog bite. Summarizing the conclusions of this paper, it is shown that small additions of aluminum to acid electric steel tend to produce aluminum embrittlement. Steels high in sulphur are affected more than low sulphur metal. As shown in the 1932 paper, embrittlement is proved to be due to a harmful shape and arrangement of the manganese sulphide inclusions. Solubility of manganese sulphide in steel is affected greatly by the oxygen content. Solubility is low in high oxygen steels. In the absence of deoxidation the sulphides precipitate early in the solidification of the metal as relatively harmless, globular inclusions, called by Sims, type I. When the steel is completely deoxidized with aluminum, the solubility of the sulphides is greater. They precipitate late in the process of (*Please turn to page* 84)

AMONG DETROIT FOUNDRIES

By A. H. ALLEN
Detroit Editor, The Foundry

AUTOMOTIVE production being on a steady crescendo, foundries in the Detroit territory catering to that trade are pushing output to the limit to permit assembly lines to get over the first bulge in new model output. Elsewhere, in the die foundries and in establishments specializing on jigs, fixtures, machine bases and the like, the slack season is approaching, but operators anxiously are scanning the war news in an effort to determine the effect on their business.

First reaction from the start of war in Europe was that business in this country would be exceptionally good. The stock market began to boil furiously. Commodity prices jumped. Many melters moved quickly to stock up on scrap before a runaway market developed in this material. Accelerated demand plus the limited tonnages available combined to move the scrap market up flashily, but it may subside a little when the initial boom sentiment cools down. It is still too early to determine the extent foundries are going to benefit from anticipated foreign orders for implements of war. It seems certain they will receive some additional business, but how soon and in what shape are questions yet to be answered.

New Cars Present Possibilities

At this time of the year, interest focuses on what car manufacturers are offering for the new year. Even though the 1940 designs may not have much bearing on foundry activities, nevertheless the industry is keenly concerned with new models. In their construction often may be discerned trends and ideas vitally affecting business in the future. Reference to a few highlights on the 1940 product may not be amiss.

The Chrysler lines—Plymouth, Dodge, De Soto and Chrysler—have moved one step closer to the original conception of the *airflow* construction principle. They have lengthened wheelbases by about 3 inches to give a better ride and raised the level of front fenders and catwalks several inches more so that front ends appear more massive, blended into a single unit.

New transmissions are featured, with controls entering through the side of the case instead of through the top to permit lowering floor levels. Gearshifts of the manual type, are all mounted on the steering column. An extension casting is bolted to the rear of the transmission to permit quicker installation of an overdrive on certain models. This extension eliminates the necessity of increasing the length of the propeller shaft to correspond with the longer wheelbases.

Another advantage of the longer wheelbase is that rear doors on four-door sedan models can be made with straight edges. No cutout or dogleg is required in the lower rear corner to clear the rear wheel housing.

Finish Parts by New Method

Changes in the De Soto engine have stepped up horsepower from 87 to 100. Finish of several engine parts, pistons, valve tappets, crankshaft, camshafts and the like is the new Chrysler superfinish, introduced for the first time last year on a number of parts. This finish also is used in other parts, clutch plates, brake drums, etc. Aluminum pistons, formerly anodized, now are superfinished and then tin plated to prevent initial scuffing.

As of Sept. 22, Buick was the only General Motors line to announce its new cars. The others previewed cars for newspaper men, but technical details were lacking. Buick has added two new lines—a 50 and a 70—featuring an entirely new type of body construction. Bodies about 5 inches wider, are lower, heavier and more rigidly reinforced.

New die cast radiator grills with wide-spaced bars, wide stainless steel belt moldings, headlamp shells streamlined into front fenders, sealed-beam headlamps, more massive front fenders are features common to all the Buick lines. Changes have been made in front and rear suspension systems. In front the springing unit has been rotated backward about 4 degrees to prevent transfer of (*Please turn to page* 86)

QUESTIONS AND ANSWERS

Amount of Pig and Scrap for Stoveplate Production

What is the proper analysis and what is the proportion of pig iron and scrap for use in a foundry making a general line of machinery and stoveplate castings?

Analysis of iron for light machinery and stoveplate castings is approximately: Silicon 2.25 to 2.50 per cent, manganese 0.50 to 0.60 per cent, sulphur 0.06 to 0.08 per cent, phosphorus 0.80 to 1.00 per cent, total carbon 3.50 to 3.75 per cent. Obviously an iron to meet that approximate analysis can be secured from a wide variety of combinations. The particular combination adopted in any given locality will depend on many factors including availability of pig iron and scrap supplies, material on hand and prevailing costs. In your rather isolated position the freight rates will present an important factor in your final decision. High physical properties are not essential in stoveplate castings. The principal feature is a free running quality that will carry the iron to the farthest extremity of the mold for a thin casting.

For your general information the usual combination in stoveplate foundries is 40 per cent pig iron and 60 per cent scrap. The pig iron usually contains equal amounts of northern and southern, either No. 1 or No. 2. In many instances it is necessary to add ferrosilicon or silvery pig in small amounts to secure the desired silicon content in the castings. Scrap in the charge is made up of 30 to 40 per cent domestic, and the remainder outside scrap, preferably stoveplate or a good grade of clean gray iron in which presumably the silicon content is between 2.00 and 2.50 per cent.

Removing Aluminum from Brass Composition Requires Skill

We shall appreciate any information you can give us on how to remove small quantities of aluminum from red metal melt.

Removal of aluminum from a molten red metal mixture is effected through addition of barium sulphate. Amount will vary depending on aluminum present in the mixture, and since this amount usually is merely guessed at, the entire proceeding is rather experimental. Barium sulphate unites with the aluminum to form an oxide which floats to the top in the form of a slag. This is skimmed off. The metal must be at a high temperature to produce the reaction and the process is carried out to best advantage in an electric furnace.

Assuming that the pot contains 100 pounds of metal of which the aluminum is 1.00 per cent. The operator stirs in 2 or 3 pounds of barium sulphate and removes the resulting slag. He then pours a small test bar and notes the skin and the broken surface. If it is not satisfactory he repeats the process and continues until the skin and the fracture of the test bar are satisfactory. However, the best procedure is to sell the contaminated material to a secondary smelter.

Life of Grate Bars Depends on Composition and Usage

What is the best composition for saw mill grate bars? What elements increase or decrease the life of these castings? Has the design of the bars any appreciable effect on their period of usefulness?

Replying in the order of presentation to the points raised in your inquiry, there is no universally recognized standard composition for saw mill grate bars. Compositions vary to a considerable extent and manufacturers of each type are prepared with facts and figures to prove the superiority of their product. A typical composition made up of 25 per cent pig iron, 35 per cent scrap iron and the remainder steel scrap would show approximately the following: Silicon 1.50 per cent, sulphur 0.10 per cent, phosphorus 0.30 per cent, manganese 0.50 per cent.

Additional resistance to heat and growth are claimed for mixtures containing small amounts of nickel and chromium, say 1.50 and 0.75 per cent respectively. Sulphur and phosphorus are the undesirable elements in these castings, therefore they are kept as low as possible. To some extent the design of the bars effects usefulness. Thus a bar with maximum air spaces will outlive a bar containing a smaller number, or more restricted openings in proportion to the total exposed area.

Has Difficulty in Cleaning Brass Pump Castings

We have a quantity of small brass pump castings to make which weigh about 4 pounds each. We are using selected red brass scrap with phosphor-copper as a flux. Our trouble is in cleaning the castings to get rid of the scale and discoloration to give the parts not machined a good appearance. We have tried milling with wood shavings and water, and also a pickling solution of sulphuric and nitric acid.

While there are a number of cleaning procedures followed in brass foundries for obtaining satisfactory appearance of the castings, we wonder if part of your difficulty may not be due to molding practice, especially since you mention scale. Without a specimen for examination, we of course cannot tell whether the scale you refer to, is due to poor facing sand, or whether it may be due to the use of too much phosphor-copper which tends to give rough surfaces occasioned by the proclivity of high phosphorus alloys to penetrate between the sand grains.

As previously mentioned, several methods of cleaning are employed, and they include: Sand blasting, tumbling with water and coarse sand or small pieces of brass scrap, and pickling or coloring as it sometimes is called. In some shops, especially those producing small cored castings, the hot castings shaken out of the molds immediately after solidification are immersed in a tub of cold water. The steam generated blows out the core and also removes the sand from the outer surface.

You did not mention the composition of the bath you used for dipping or pickling, and we suggest that you try one composed of two gallons of sulphuric acid, one and one-half gallons of nitric acid, and two ounces of salt. Always pour the sulphuric acid slowly into the nitric acid with constant stirring and allow the solution to become cold before use. Only a momentary dip or immersion is required. The castings are washed in cold and then in hot water. If the castings are not lacquered, the final hot water rinse should contain one ounce of whale oil soap to one gallon of water. After the hot rinse the castings should be dried in hard wood sawdust.

Small Truck Wheels Cracking In Spokes Increase Loss

We have had trouble with cracked spokes in a small truck wheel 8 inches diameter, hub diameter 2⅛ inches, hub thickness 2⅜ inches with a ¾-inch diameter core, metal thickness in the rim ¼-inch. Cupola mixture is made up of 20 per cent pig iron, 20 per cent machinery scrap, 33 1/3 per cent automobile scrap and 27 2/3 per cent return scrap. Analysis of the pig iron shows: Silicon 2.25 per cent, sulphur 0.029 per cent, phosphorus 0.74 per cent, manganese 1.25 per cent. Castings were left in the sand until they were cold. What general rules should be applied to truck wheels and pulleys?

Many wheels of the general character referred to are not designed properly to withstand strains set up while the metal is passing from the liquid to the solid state. Thickness of metal in the hub or rim is not alike. One section cools faster than the other. Contraction strains develop when the heavier section commences to draw away and as a result the connecting spokes crack in one or in several places. To counteract this tendency where the hub is heavier than the rim, as in the present instance, the foundryman uses a comparatively soft iron.

A remedial measure frequently employed to equalize the cooling speed of hub and rim is to strip the top of the rim immediately after the iron has solidified. The core then is removed with a piece of steel rod and a little water. In the cupola charge as outlined, the silicon content of each of the components, pig iron, auto scrap, machinery scrap and return scrap, is about the same, between 2.00 and 2.25 per cent. Allowing for a 20 point melting loss, the iron in the castings contains between 1.80 and 2.00 per cent silicon. This iron is too hard and too brittle for castings which develop contraction strains between heavy and light sections. The silicon content should be at least 2.50 per cent.

Loss Due to the Shrink Holes Under Risers Is High

Our usual cupola mixture contains 10 to 15 per cent pig iron, 10 to 20 per cent return scrap and the remainder outside scrap mainly automotive cylinders and heads. In a 42-inch cupola the charge ranges from 1000 to 1250 pounds with 135 to 150 pounds beehive coke between charges. We add from 3 to 5 pounds ferrosilicon in briquet form and occasionally 2½ pounds ferromanganese. We have no difficulty with light castings, but in sections 2 inches thick and upward we find shrinkage cavities. We have tried various methods of gating and risering and in some instances have churned the risers but without effect. Castings are sound and machinable, but loss due to shrink holes under the risers is entirely too high.

To use a homely illustration your castings are suffering from malnutrition or a form of metal anemia. Pig iron contains all the necessary vitamins to produce fat, healthy castings. Each time iron is remelted it loses a certain amount of the life giving properties. The present proportion of 10 to 15 per cent pig iron, presumably No. 2—is not sufficient to revitalize the remainder of the charge 85 to 90 per cent scrap. Obviously, the remedy is to increase the amount of pig iron in the charge. However, to follow the same analogy, economic conditions have been known to interfere with a patient's reception of a proper food supply, or rather a properly proportioned supply.

Some alternative method must be employed to keep the patient alive and up to par. Where castings are made from an iron that shrinks abnormally, large feeding risers must be provided. What is more important, and this point frequently is overlooked, the risers must be connected to the casting in a manner that will allow the molten metal to flow until the casting solidifies. If the riser, or the neck of the riser solidifies before the casting, the flow of metal is shut off and a cavity appears in the casting. The method always has been practiced in steel foundries, where the yield of castings usually is only half the amount of metal melted.

Friction Disks May Need To Be Strong

We make bronze friction disks for paper machines, and our customer has observed that when electrolytic copper is used in the mixture, turnings come off in long curls while use of casting copper results in turnings coming off as chips. We would like to be able to tell the customer that as far as wearing quality and soundness of the castings are concerned, disks made with casting copper are as good as when made with electrolytic copper.

Obviously use of bronze for a friction disk makes certain demands upon the material which necessitates certain definite physical properties. Friction is not related to tensile strength or elongation as far as we know. There may be reasons why the disks must have a certain tensile strength or elongation, such as peculiarity of design or stresses which are set up by operating conditions. Bronze made with electrolytic copper obviously is free from impurities contained in casting copper which tend to reduce the elongation, and chips of material made with electrolytic copper are capable of more stretch or strain, resulting in turnings in the form of long curls.

It is entirely possible that comparison of physical properties obtained on similar test bars under the same conditions would convince your customer that friction disks made with casting copper will serve satisfactorily. The type of test bar suggested is that specified by the government for cast nonferrous alloys, and in a number of specifications of the A. S. T. M. such as for castings of 88-8-4; steam or valve bronze castings; composition brass or ounce metal castings, etc. That bar has a heavy feeder section directly above to insure a solid bar.

Any difference in soundness will be shown in the fractured bars, and we are quite certain that with good melting practice, either type of copper will produce sound castings. If maximum elongation for the particular composition is deemed one of the essential characteristics, then your customer may feel that use of electrolytic copper is required. We believe that all properties will be almost identical, and we do not believe that elongation is very essential in the success of the disks from the standpoint of frictional characteristic or frictional use.

Various Methods In Use for Molds

We are contemplating increasing our output of open-hearth ingot molds and consider this an opportunity of improving our foundry practice. Can you give us particulars of the best molding practice in the United States, also a comparison between jolt machines and sandslingers.

So far as performance is concerned, ingot molds are made satisfactorily either on jolt machines or under the sandslinger. Relative cost of operation depends to a considerable extent on local conditions. In this connection it seems pertinent to point out that unless molds are made in sufficient volume to keep any type of equipment in fairly constant operation, the depreciation, overhead and other factors may offset economies effected as compared with the usual method of hand ramming the molds. Articles on modern, ingot molding methods have been presented on several occasions in THE FOUNDRY.

Further as a possible point of interest, a prominent user of ingot molds has adopted a method for making ingot molds which differs radically from the method or methods used by other manufacturers of these castings. Core and mold are made horizontally, dried in that position, assembled and then turned up on end and poured in the usual manner. Recently a prominent manufacturer of ingot molds has adopted a process of making ingot molds in cement bonded sand.

Removing Gates and Risers Difficult

Can you give us any information on the best way to remove gates and risers from large manganese bronze castings weighing 4 to 5 tons? Present method used is to cut as close to the casting as possible with a cut off saw, and chip flush with a chipping hammer. The chipping operation of course, is difficult and expensive.

Removal of gates and risers from large manganese bronze and also of bronze castings always has been difficult since they must be large, and the time required seems to be all out of proportion. There is no economical method, and consequently, cleaning and snagging cost must be considered in production of such castings. Usual method and probably the most economical is to chip with an air hammer as close to the outline of the casting as possible so that the saw may cut close to the casting.

In many cases the saw cannot be used, and the riser and gate must be removed by chipping. A narrow chisel will cut more rapidly than a saw, and although the chisel forms more chips due to a wider cut, the speed of removal more than compensates the waste of metal. Torch cutting as practiced with steel castings is not successful with nonferrous metals for several reasons. In the first place the nonferrous metals are too expensive to burn up; second, their heat conductivity is high which causes difficulty in localizing heat concentration, and trouble from distortion and warping.

A large, enthusiastic group gathered to participate in the festivities which were provided

Some foundrymen find that they can speed up riser removal by use of grinding wheels properly applied to make sharp corners from which to start saw cuts or chipping operations. In chipping careful attention should be given to the shape of the cutting edge. A first quality tool steel should be used to insure a long lived cutting edge, and the latter should be ground to provide the maximum speed of cutting. That will require some experimenting but it will be well worth the effort and time spent upon it.

Thin Section Edges Become Chilled

We make a varied line of castings which differ considerably in section thickness, but the thin sections give trouble. Our castings have a tendency to chill or become unmachinable right on the edge. We have somewhat the same trouble on the outer edge of light pulleys unless we use almost 100 per cent pig iron. We use pig iron containing 3.25 per cent silicon, 0.74 per cent phosphorus and 0.72 per cent manganese. Can we use an alloy added to the ladle at the spout, and eliminate such trouble? We have been told that an addition of 10 per cent steel scrap to all our castings would have a beneficial effect. We also make grate bars from a mixture of 35 per cent pig iron, 65 per cent machinery scrap and foundry returns. Can we improve the lasting qualities of the grates by the addition of steel scrap, or of some alloy to the ladle, or both?

According to our calculations, a mixture of 60 per cent of your present pig iron and 40 per cent machinery scrap and foundry returns should give you an iron which contains about 2.50 per cent silicon and which should not give any trouble except possibly with extremely thin sections. Therefore, we are wondering whether your melting practice is such that you are obtaining good hot iron. While addition of steel scrap would improve the physical properties of your iron, we believe that under your present conditions, that addition would accentuate difficulties from chilled edges since its tendency is to dilute the iron, and reduce the silicon content.

Several methods are available to eliminate the chilled edges. One is to employ pig iron with a higher silicon content. Another is to add a small amount of ferrosilicon or nickel or graphite to the ladle. An addition of 5 ounces of 80 per cent ferrosilicon to 100 pounds of iron will increase the silicon content about 0.25 per cent. Addition of 8 ounces of nickel to the same quantity of metal will give approximately 0.5 per cent nickel in the final iron and provide a beneficial effect on the structure in addition to overcoming the chilled edges. Addition of from 2 to 5 ounces of graphite to 100 pounds of metal in the ladle, also should correct the trouble.

Investigation of iron for furnace fire pots and grate bars has indicated that addition of 1 per cent nickel and 1 per cent chromium to the regular iron used for those purposes adds considerably to the life of such furnace pots and grates. In fact a number of furnace manufacturers making such additions are guaranteeing that those parts will have a life of 20 years.

Cheapness Does Not Mean Lowest Cost

Can you supply us with a cheap yellow brass mixture which is easy to cast, and has a low shrinkage? Our present composition contains 74 per cent copper, 3 per cent tin, and 20 per cent zinc. We have been asked to use from 30 to 35 per cent zinc with no tin. Castings made weigh up to 20 ounces with light and heavy sections. Castings must machine easily, and have a smooth finish when cast. At present we use 5 different mixtures melted in an electric furnace. Is there not a chance of picking up some of the zinc in heats following yellow brass?

Without knowledge as to application of castings, it is difficult to suggest the most desirable alloy. Cheapness of ingredients does not always mean the lowest cost castings since defects of various kinds may cut the yield to a point where use of an expensive alloy would be cheap by comparison. Since copper-zinc alloys without tin or lead give more trouble in machining than when they contain one or both of those elements, it is advisable to keep that fact in mind.

Your present composition can be reduced in cost to some extent by reducing the tin content to 1.5 per cent. If pressure resistance is not a factor in your castings, castability can be increased by addition of not more than 0.02 per cent aluminum. Presence of lead is imperative for rapid machining qualities, but too large a quantity of that element reduces tensile strength and elongation. A good yellow brass that casts well and machines well contains 70 per cent copper, 1 per cent tin, 2 per cent lead and 27 per cent zinc. Addition of up to 0.02 per cent aluminum develops a smooth skin on the surface. Tensile strength of the alloy is 29,000 pounds per square inch, yield point is 15,000 pounds per square inch elongation is 25 per cent, and brinell hardness number is 53.

In reference to pick-up of zinc, it is obvious that alloys required to be zinc-free should not be melted on a hearth which previously has been used for yellow brass high in zinc. Also if the yellow brass contained aluminum, that element will contaminate following heats, and for that reason it often is inadvisable to have aluminum in the yellow brass mixtures.

vided

the annual stag outing and picnic held recently by the Southern California chapter

MEN of INDUSTRY

GORDON T. WILLIAMS, for the past 9 years metallurgist, Cleveland Tractor Co., Cleveland, has resigned to accept the position of metallurgist, testing and research laboratories, Deere & Co., Moline, Ill. Mr. Williams will be occupied with heat treating and other metallurgical problems pertaining to the company's factories. He is a member of the American Foundrymen's association, American Welding society, American Society for Testing Materials, and American Society for Metals, having served as chairman of the Cleveland chapter of the latter in 1937.

• • •

EUGENE E. GRIEST, formerly vice president and general manager, Fort Pitt Malleable Iron Co., Pittsburgh, has been made vice president and general manager, Lehigh Foundries, Inc., Easton, Pa.

• • •

WILSON H. MORIARTY has been promoted to sales manager, Cleveland works, National Malleable & Steel Castings Co., Cleveland. Mr. Moriarty joined the company in 1919 following graduation from Case School of Applied Science, and army service. He was resident inspector, East St. Louis plant and later Chicago and Cleveland plants, subsequently becoming chief inspector for all National Malleable & Steel Castings plants. He has been in the sales division since 1931, and is the inventor of a grate bar used in sintering plants.

• • •

THOMAS ADDISON recently has been named chief designing engineer, Defiance Machine Works, Defiance, O. Mr. Addison was born in England and received his academic technical training at Sunderland Technical college. After graduating from that school, he worked a number of years in his native country acquiring practical experience. He came to the United States in 1911, making his home in Cincinnati where he served as design head and engineer for a number of important tool companies.

• • •

R. C. HARRELL, production control superintendent, Stockham Pipe Fittings, Birmingham, Ala., recently was elected chairman of the Birmingham chapter of the A.F.A. Mr. Harrell was born in Nashville, Tenn., and received his education in the Birmingham Public schools and at Birmingham Southern and Howard colleges. His education was interrupted by the war, when he saw service in the navy. Upon discharge he entered the employ of the Stockham company and has been with that organization continuously since that date. He was superintendent of the gray iron foundry for 11 years until his promotion to his present position. Mr. Harrell has been active in the work of the Birmingham chapter and has served as secretary-treasurer and vice chairman of that organization.

• • •

FRED W. CEDERLEAF has been made factory manager, Dodge Mfg. Co., Mishawaka, Ind., producer of industrial transmission equipment. He formerly was general manager, Diesel Equipment Corp., Chicago.

• • •

PAUL S. MENOUGH has been made chief engineer of the Standard Alloy Co., Cleveland. Mr. Menough was formerly with Duraloy Co., Michigan Steel Casting Co., and Michiana Products Co. FRANK P. MORROW, for the past 6 years district manager at Detroit for Stand-

(*Continued on page 40*)

Eugene E. Griest

Wilson H. Moriarty

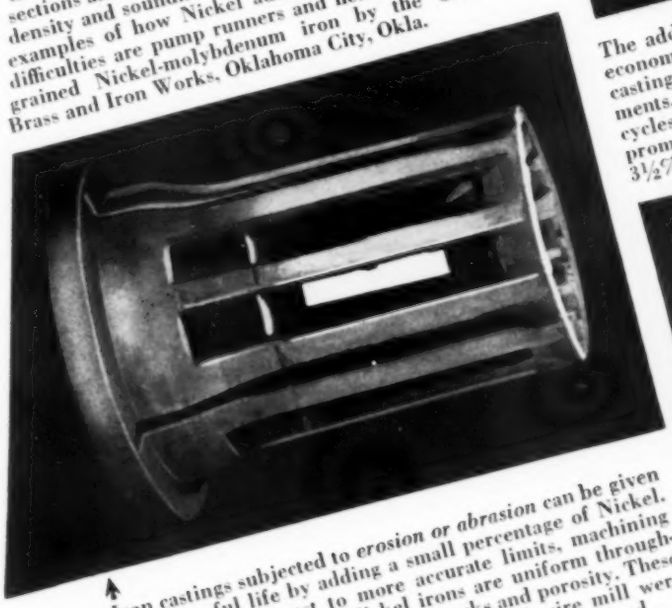
R. C. Harrell

Gordon T. Williams

TRICKY PATTERNS

. . . . turned into profitable jobs by adding NICKEL to cast irons

Variation in section thicknesses often present problems, particularly if the casting must be readily machinable. Nickel cast irons help turn tricky patterns into profitable jobs for Nickel eliminates chill in thin sections and hard spots at corners and edges, promotes density and soundness in heavy sections as well. These examples of how Nickel additions reduce production difficulties are pump runners and heads, cast in dense-grained Nickel-molybdenum iron by the Oklahoma Brass and Iron Works, Oklahoma City, Okla.



Iron castings subjected to *erosion or abrasion* can be given longer useful life by adding a small percentage of Nickel. Patterns can be cast to more accurate limits, machining costs reduced, because Nickel irons are uniform throughout, thereby reducing shrinkage cracks and porosity. These wear resistant drawing blocks for a steel wire mill were cast in a Nickel iron by the Kilby Mfg. Co., Cleveland.

The addition of "F" Nickel shot or electro squares is a practical and economical method of increasing many desirable properties in precision castings. Nickel works alone or in conjunction with other alloying elements. Nickel iron castings retain dimensional accuracy throughout cycles of repeated heating and cooling. Moreover their Nickel content promotes pressure-tightness. These compressor cylinders were cast in a 3½% Nickel iron by Canadian Ingersoll Rand Co., Ltd., Sherbrooke, Que.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Continued from page* 38)

ard Alloy, has been made sales manager of the Standard company with headquarters in Cleveland.

♦ ♦ ♦

HAROLD L. HENSZEY, Carborundum Co., Philadelphia, recently completed his second term as chairman of the Metropolitan Philadelphia Chapter of the A. F. A. and was elected chapter historian. Mr. Henszey attended the public schools of South New Jersey, and received his first position in industry at the Baldwin Locomotive Works, Philadelphia, in 1901 from Samuel Vauclain, present chairman of the board of that organization. From 1903 to 1906 he was connected with the engineering department and from 1907 to 1912 had charge of the tool steel department where all of the tool steel and small tools purchased by the company were tested. In January, 1913, he became connected with the sales division of the Carborundum Co., Niagara Falls, N. Y., and for more than 25 years has been selling to the foundry and machine shop industries. Mr. Henszey was active in the work of the Philadelphia Foundrymen's association, predecessor to the present chapter, and served on the board of directors of the former organization.

♦ ♦ ♦

HARRY W. DIETERT, president, Harry W. Dietert Co., Detroit, recently was made chairman of the Detroit chapter of the A.F.A. Mr. Dietert graduated from Iowa State college in 1920 and then took a technical apprentice course at the Westinghouse Electric & Mfg. Co. In 1922 he was made instructor of machine and foundry practice at Rice institute and in 1923 entered the graduate school at the University of Illinois where he obtained his master of science degree. In 1923 he became connected with U. S. Radiator Co., in Detroit, starting as plant engineer. In 1927 he was made chief research engineer and in 1933 chief engineer. In 1936 he resigned to devote his time to the Harry W. Dietert Co. which he founded in 1925. Mr. Dietert has contributed greatly to the advancement of the foundry industry through his research work on sand contribution to the literature of the industry and his many talks before the national association as well as various chapters and local groups.

♦ ♦ ♦

W. J. CORBETT, vice president, Atlas Steel Casting Co., Buffalo, recently was elected chairman of the Buffalo Chapter of the A. F. A. Mr. Corbett received his education at the schools in Erie, Pa. and graduated from Carnegie Institute of Technology with degree of bachelor of science in mining engineering in 1914. Later he received the degree of metallurgical engineer from Carnegie. After serving 1 year as a special apprentice at the Alliance works of the American Steel Foundries, Mr. Corbett was transferred to the Chester works of the same company and became production engineer before resigning in 1917 to accept a commission in the United States army. Following his discharge from the army he was placed in charge of the manufacture of castings at the Watertown arsenal. In 1919 he again became affiliated with the American Steel Foundries as assistant to fourth vice president, with headquarters in Chicago. In 1921 he was connected with the Steel Founders' Society of America as cost accountant and in 1923 served as industrial engineering for the Electric Steel Founders' research group, later becoming secretary and manager of the Steel Founders' Society of America in 1925. Then in 1929 he was assistant to the president of the Fort Pitt Steel Casting Co., McKeesport, Pa., later being elevated to the position of works manager for that company. Following that he joined the Atlas Steel Castings Co., Buffalo, for which company he is now vice president.

Mr. Corbett also is chairman of the technical and operating group of steel foundries in Western New York and Northeastern Pennsylvania, and is a member of the executive committee, Inter-Allied Foundries of New York state.

♦ ♦ ♦

LEROY E. EVERETT, foundry manager, the Key Co., East St. Louis, Ill., recently was made chairman of the St. Louis District chapter of the A.F.A. Mr. Everett was born in 1898 and attended the University of Wisconsin. He started his foundry career in 1921 at the Indiana Harbor works of the American Steel Foundries as a special apprentice. In 1925 he became connected with the Nugent Steel Castings Co., Chicago, as research engineer, and 2 years later was appointed foundry engineer of the Illinois Clay Products Co. In 1931 he was made superintendent of the steel foundry of the Stockham Pipe Fittings Co., Birmingham. Two years later he went to Los Angeles as superintendent of the Warman Steel Castings Co. and in 1934 returned to the Stockham company in the same capacity. He joined the Key Co. in 1937. Mr. Everett has been active in the work of the St. Louis District chapter and served as vice chairman during the past year.

♦ ♦ ♦

F. J. RYAN, formerly president of the R-S Products Corp., Philadelphia, in charge of sales and engineering, has resigned to organize the Ryan Engineering Co., 5244 Germantown avenue, Philadelphia, which will provide special engineering service.

♦ ♦ ♦

R. W. MCKEE has been named acting manager of the Birmingham, Ala., office of the Hercules Powder Co. F. GEORGE TRESCHER has been

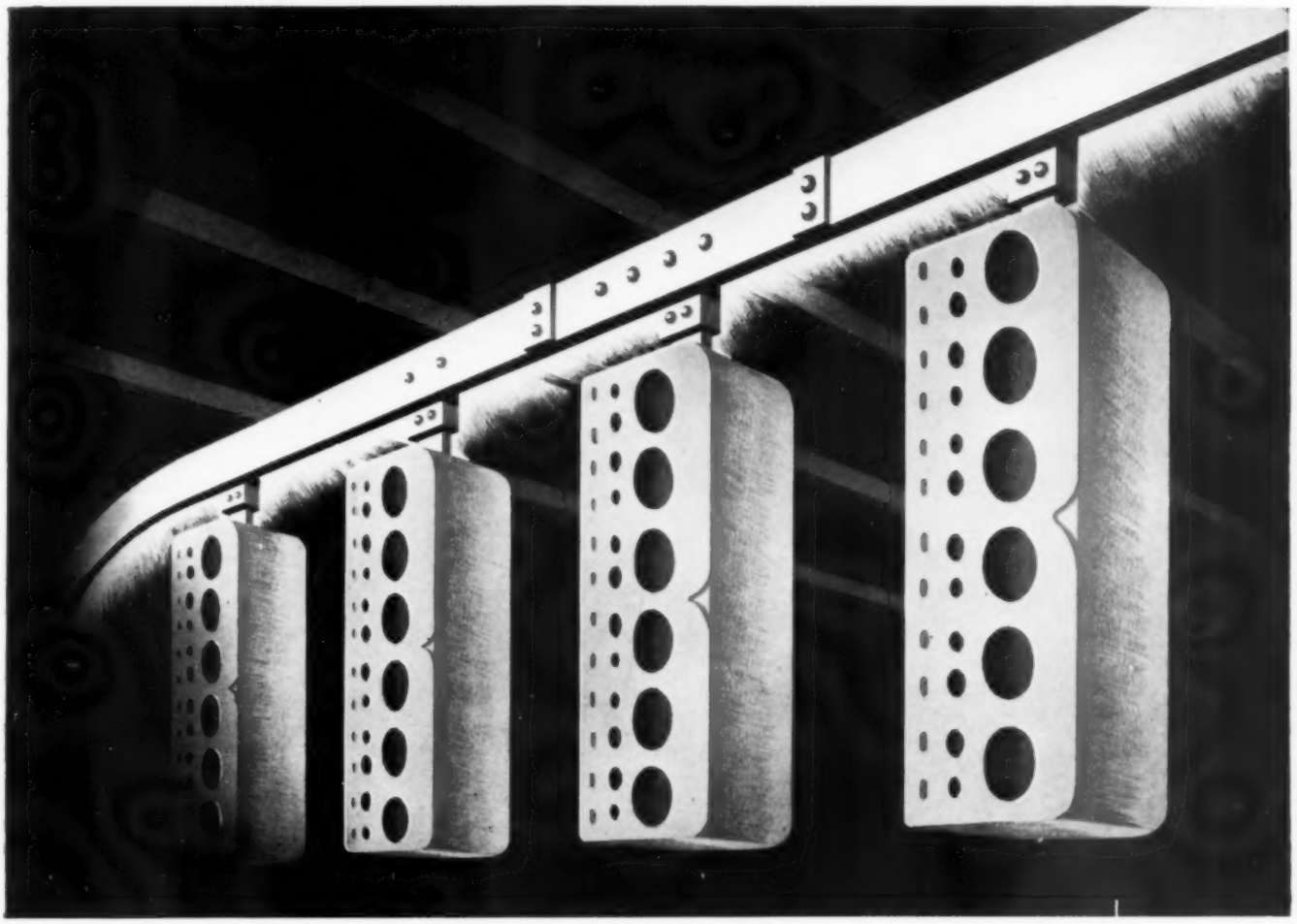
(*Concluded on page* 42)

Harold L. Henszey

Harry W. Dietert

W. J. Corbett

Leroy E. Everett



MEETING REQUIREMENTS

The addition of Molybdenum, alone or combined with other alloying elements such as chromium, is an easy — and economical — way to make cast iron meet cylinder block requirements in modern internal combustion engines.

A good base iron thus alloyed has all the requisite properties. It is strong, and tough. Its modulus of elasticity is high; therefore, block sections can be thin where necessary. Resistance to growth is good, and the iron will retain its strength at elevated temperatures.

Molybdenum irons have production advantages as well. Likelihood of cracking, either in the foundry, or in service, is small. Machining under ordinary shop conditions presents no difficulties.

Detailed information on Molybdenum irons suitable for cylinder block and many other services are given in our technical book "Molybdenum in Cast Iron". It will be sent free to engineers and production executives.

Visit our booth, L-334, at the National Metal Exposition, October 23-27, in Chicago.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

(*Concluded from page 40*)
appointed acting manager of the San Francisco office of that company. He replaces J. B. JOHNSON who was transferred to Wilmington as director of purchases.

♦ ♦ ♦

W. S. MURPHEY, P. O. Box 485, Charlotte, N. C., has been appointed district sales engineer for Harnischfeger Corp., Milwaukee.

♦ ♦ ♦

ROBERT N. YATES, for a number of years in the sales department, Erie Foundry Co., Erie, Pa., has been made assistant sales manager.

♦ ♦ ♦

CLARENCE ANDERSON who has been with Madsen Iron Works, Huntington Park, Calif., many years, recently was appointed foundry superintendent, Apex Steel Corp., Los Angeles.

♦ ♦ ♦

WARREN A. SILLIMAN has been made metallurgist, Cleveland Tractor Co., Cleveland. A graduate of Fenn college, Cleveland, he has served in the capacity of assistant metallurgist for the last 6 years.

♦ ♦ ♦

BERT OLDFIELD, former vice chairman Southern California chapter of the A.F.A., recently joined the staff of the Santa Ana Iron Works, Santa Ana, Calif.

♦ ♦ ♦

JAMES WILKINS, formerly connected with Dayton Waldrip Co., Hollydale, Calif., now is in charge of the gray iron division, Kay-Brunner Steel Products Co., Alhambra, Calif.

♦ ♦ ♦

L. D. PEIK, 421 N. B. C. building, Cleveland, recently was appointed sales representative for Northern Ohio and the Buffalo area by the Productive Equipment Corp., Chicago.

♦ ♦ ♦

J. A. BOUFFARD, pig iron and coke sales manager, the Hamilton Coke & Iron Co., Hamilton, O., subsidiary of American Rolling Mill Co., Middletown, O., has resigned to join Milwaukee Solvay Coke Co., Milwaukee, where he will have similar duties.

♦ ♦ ♦

M. H. MORRIS has been selected president, Morris Machine Works, Baldwinsville, N. Y. J. J. LONERGAN was appointed vice president and general manager, after 37 years' service with the firm. A. G. FORSSELL has been named second vice president and R. S. MERCER reappointed secretary and treasurer.

♦ ♦ ♦

WILFRED S. MCKEON, president of the Sulphur Products, Inc., Greensburg, Pa., recently was elected president of the Century Fittings Co., also of Greensburg, succeeding the late William J. Burkart. Other officers are as follows: EDWARD P. DORAN, second vice president, JOHN DARR, secretary, and EDWARD F. HOWARD, treasurer.

♦ ♦ ♦

NEIL CURRIE JR. recently was made assistant to the vice president in charge of manufacturing, General Electric Co., Schenectady, N. Y. Mr. Currie formerly was manager of the Fort Wayne works and has been succeeded there by MANLY E. LORD.

♦ ♦ ♦

FREDERICK A. SEARLE recently resigned as vice president and director, Landers, Frary & Clark, New Britain, Conn., due to ill health. He had been with the company 39 years. ARTHUR E. ALLEN, a former vice president, Westinghouse Electric & Mfg. Co., has been elected to succeed Mr. Searle as a director.

♦ ♦ ♦

B. F. MERCER has been appointed a member of the steel foundry sales staff, Allegheny Ludlum Steel Corp.,

B. F. Mercer

with headquarters at Brackenridge, Pa. Mr. Mercer served first as foreman and then as general superintendent of the Union Steel Casting Co., Pittsburgh, from 1912 until 1928. In 1929 he entered the employ of the Pittsburgh Steel Foundry Corp. as manager of the Sharon, Pa. works. From 1930 to 1933 Mr. Mercer acted as vice president in charge of opereations for the Union Steel Casting Co. and during the latter part of 1933 he became associated with National Erie Corp., Erie, Pa. as sales representative. He retained that position up to the time of his present appointment.

♦ ♦ ♦

E. J. LOWRY, who recently returned from Russia, now is associated with the Woonsocket Color & Chemical Co. Mr. Lowry spent 8 years in Russia as chief metallurgist of heavy industries and 1 year in France, England, Czechoslovakia and other European countries as consultant in iron and steel plants. Prior to going abroad Mr. Lowry was connected with Hickman, Williams & Co. as consultant on foundry problems.

♦ ♦ ♦

N. C. PATTERSON, assistant plant engineer at the Dodge main division, Chrysler Corp., Detroit, has been appointed plant engineer, succeeding H. S. WELLS, now staff plant engineer.

♦ ♦ ♦

GEORGE B. COMFORT has been made manager of sales promotion, Schramm Inc., West Chester, Pa., manufacturer of portable and stationary air compressors. Mr. Comfort formerly was manager of engineering sales and prior to that was factory manager.

♦ ♦ ♦

W. O. LEONARD now is directing operations at the Wilson Foundry & Machine Co., Pontiac, Mich. MICHAEL RUTZEN, formerly foundry engineer, now is acting foundry superintendent, succeeding OMER L. ALLEN, new foundry superintendent of the Pontiac Motors division of General Motors Corp.

♦ ♦ ♦

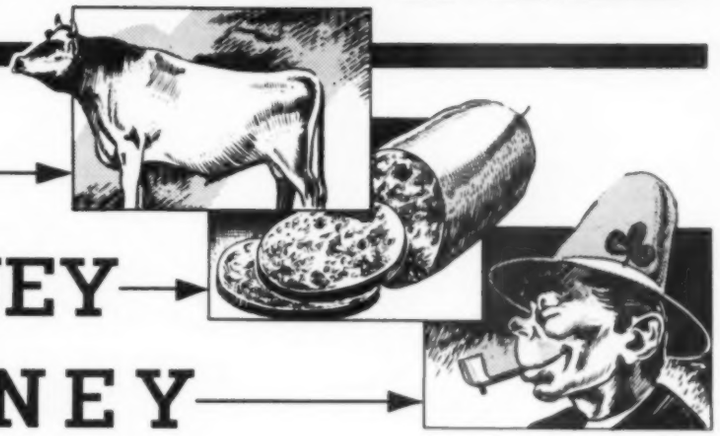
WILLIAM TOURVILLE, formerly maintenance superintendent of the Detroit Steel Casting Co., Detroit, has been appointed general superintendent, succeeding the late E. W. PIKE. Mr. Tourville was connected with that company in 1915 and 1916, resigning to accept a position with the Atlas Steel Casting Co., Buffalo. He returned to the Detroit Steel Casting Co. in 1930, serving as master mechanic in charge of all machinery and equipment.

Book Review

Cast Iron Pipe, by Percy Longmuir; cloth; 104 pages 5 x 7½ inches; published by J. B. Lippincott Co., and supplied through THE FOUNDRY for $2.50.

This is one of a series of industrial text books issued in Great Britain and covers briefly the principal features connected with the manufacture and properties of cast iron pipe with special reference to centrifugal casting. The text is supplemented by 53 illustrations including 4 micrographs. Material in the book is presented under seven chapter headings: Vertically cast pipe; metal spun cast iron pipe; sand spun cast iron pipe; special castings; joints for cast iron pipe; metallurgical control; properties of cast iron pipe. The book closes with two pages of references and an index.

DIXIE BOND



NO BULL →

NO BALONEY →

NO BLARNEY →

JUST SOME PLAIN FACTS!

FACT NO. 1—Dixie Bond averages 25% higher green strength than bentonite!
RESULT:—Less clay used, lower cost, less fines in sand, less tempering water required.

FACT NO. 2—Dixie Bond gives higher permeability than bentonite!
RESULT:—Lower scrap, greater freedom from blows, better finish because finer sands can be used.

FACT NO. 3—Dixie Bond has about one half the dry strength of bentonite!
RESULT:—Faster shake out, less abuse of flasks, soft lump free sand which is easily reconditioned and no cracked castings.

FACT NO. 4—Dixie Bond gives much better flowability than bentonite!
RESULT:—Better finish, no swells, castings true to pattern.

FACT NO. 5—Dixie Bonded sand has less contraction at high temperature than bentonite bonded sand!
RESULT:—Less fins, less scabs, less cope pull downs.

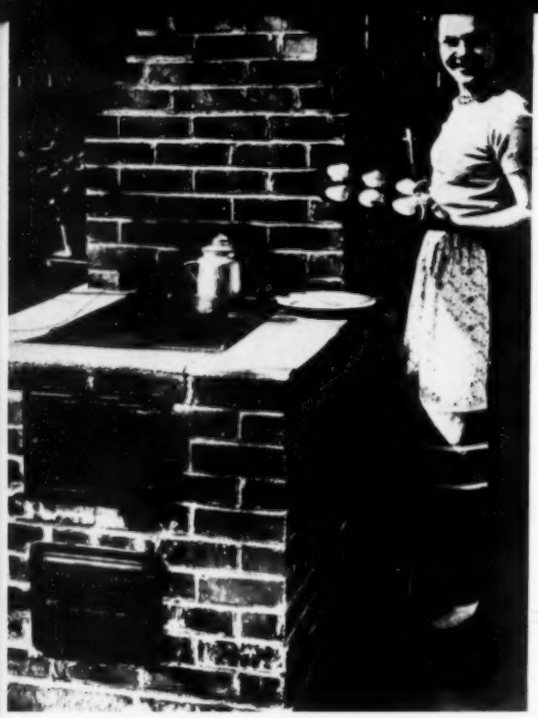
FACT NO. 6—Dixie Bonded sand has a higher sintering point than bentonite bonded sand!
RESULT:—Better finish and cheaper cleaning.

And what else could we ask for in a bonding clay? Your sample is waiting!

EASTERN CLAY PRODUCTS, INC.

EIFORT, OHIO

DETROIT, MICHIGAN: 1414 UNITED ARTISTS BLDG. BUFFALO, N. Y.: 228 HIGHGATE AVENUE



View of the fireplace, showing the various castings used in the construction

DEVELOPS PROFITABLE SIDE LINE

By F. H. COLMAN

IF WE are to believe all we hear and read, men of the great outdoors, hunters, trappers, explorers, bandits on the run, posse ditto, vagabonds and plain bums experience no trouble in cooking elegant meals with nothing more elaborate than a frying pan and a coffee pot perched precariously over a small fire of twigs or a handful or two of dried grass. Authors of best sellers dealing with the underworld, the submerged tenth, invariably refer to the savory mulligans cooked in tomato cans in the jungle. Drooling readers for years have sat behind imaginary camp fires sniffing the odors and watching deft and hardy lads in coonskin caps, roasting luscicus tidbits on the ends of sharpened sticks.

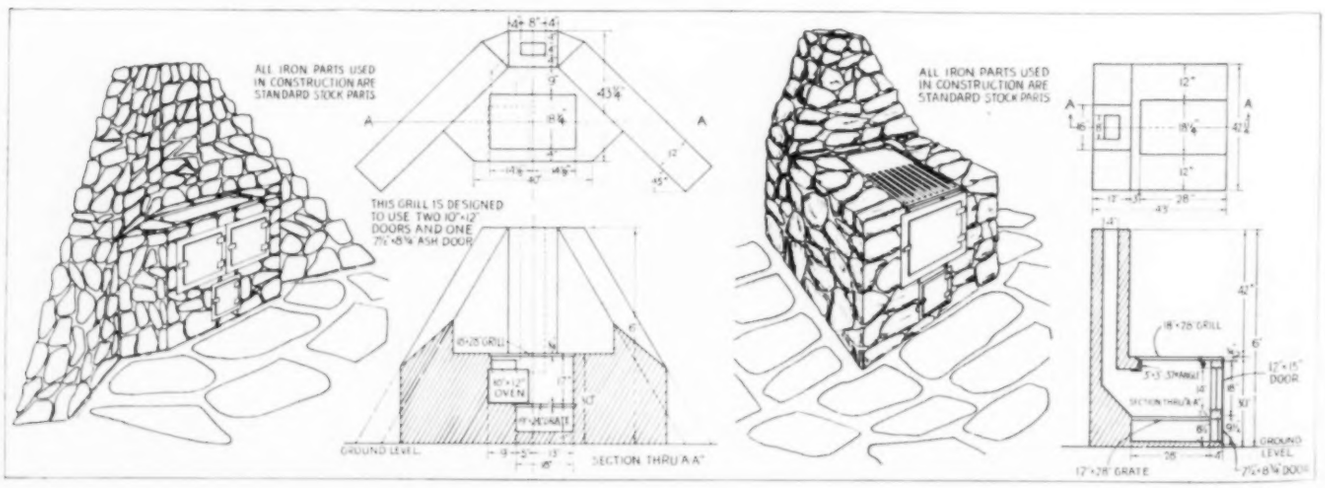
Amateur picnickers lulled into false security by the apparently simple technique have found that starting a fire requires time and patience and a reasonable supply of combustible material. Faith alone will not keep a coffee pot upright or a frying pan horizontal over an open wood fire. Content of one is spilled in the fire and the food in the other is burned to a cinder. The hand holding the sharpened stick grows weary and the piece of meat on the end falls into the flames or the ashes. A total loss in either case.

Twenty-five or 30 years ago the park authorities in several towns and cities, ever mindful of the citizens' comfort and welfare, commenced the installation of outdoor fire places on which the little pal could prepare waffles, hot dogs and other indigestible picnic trifles while the lord and master soaked his feet in the lake and yielded up a gill or two of his life blood to keep a swarm of mosquitos in good fighting trim.

About the time the fire place movement was beginning to gather momentum, a momentum which in recent years has carried it to practically every state in the union, the Santa Ana Iron Works, Santa Ana, Cal., donated a few cooking plates to be used on the outdoor fireplaces of a local park. So many inquiries developed for similar equipment to be used in private gardens that the company found itself handling an ever increasing and profitable side line. Eventually the side line became the predominant line. Today the firm supplies outdoor cooking equipment to the state forestry department of the entire southern California area to roadside stands, parks and owners of private gardens.

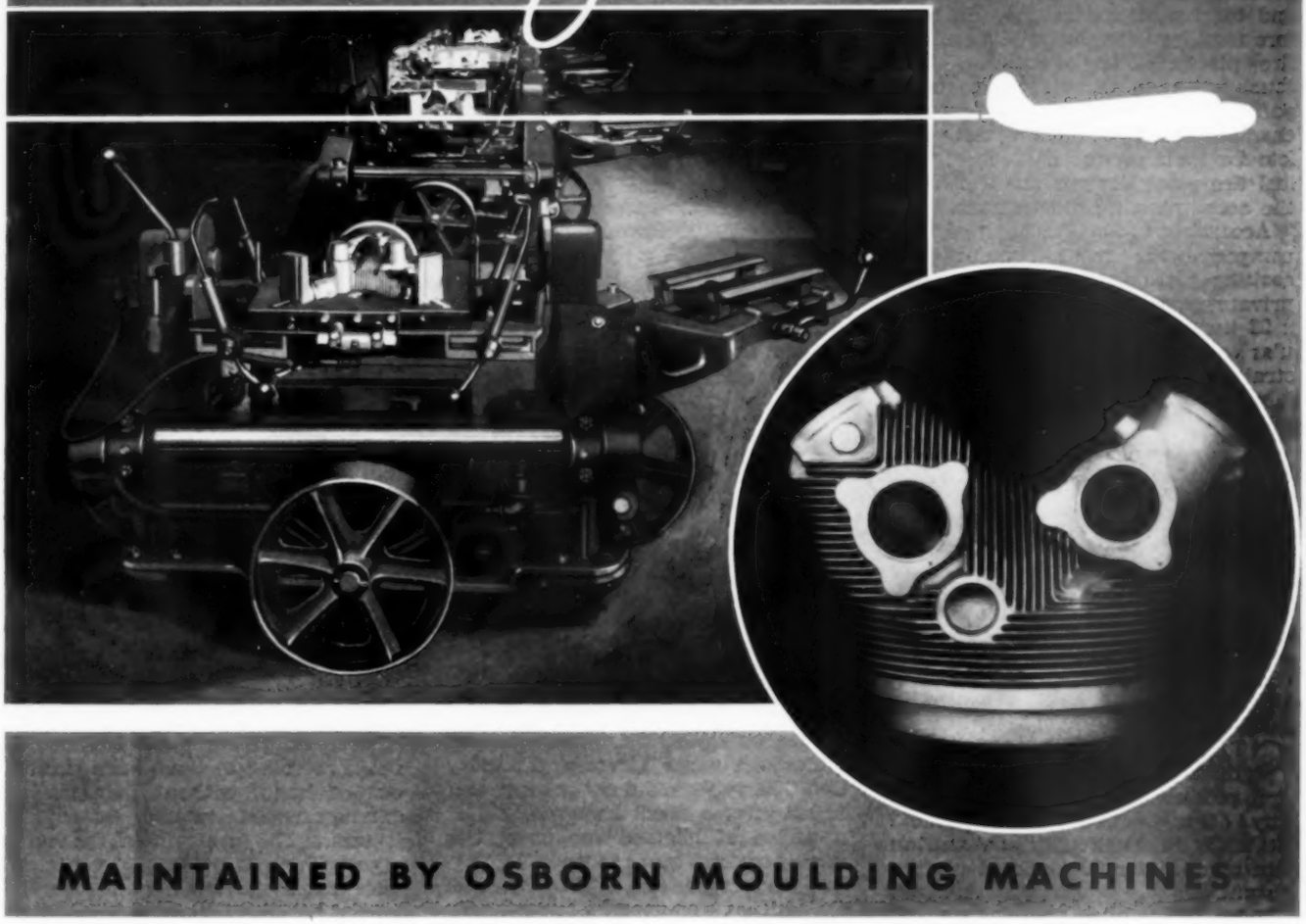
Outdoor cooking appliances have kept pace with the development in other pieces of apparatus designed to add to the pleasure and comfort of those who enjoy the fresh air and the sunshine, or for that matter the light of the moon and the stars. The modern 1939 fireplace is equipped with grills for steaks, plates for hot cakes and ovens. Success of the Santa Ana company in developing that line of business may serve as an incentive to other foundries. Treated as a temporary fad at first, the tendency to do more and

(*Concluded on page* 46)


ALL IRON PARTS USED IN CONSTRUCTION ARE STANDARD STOCK PARTS
THIS GRILL IS DESIGNED TO USE TWO 10"×12" DOORS AND ONE 7¼"×8¾" ASH DOOR
18"×28" GRILL
12"×15" DOOR
GROUND LEVEL
SECTION THRU A-A
12"×28" GRATE
7¼"×8¾" DOOR

Blueprints made up by the firm supply the necessary information for construction of the outdoor fireplaces

Aircraft ACCURACY



MAINTAINED BY OSBORN MOULDING MACHINES

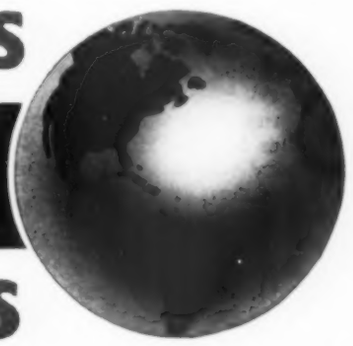
● Five years ago, a battery of No. 601 Osborn Jolt-Rollover Pattern Draw Moulding Machines went into action producing cylinder heads for one of the leading manufacturers of aircraft engines.

The original battery of machines was increased six times in the past five years. Here is convincing proof of the dependable performance of No. 601 line of Osborn Jolt-Rollover Pattern Draw Moulding Machines for work demanding extreme moulding accuracy on fast, continuous production schedules.

Osborn engineers are prepared to assist you in a check-up of your present moulding equipment to determine possible improvements to meet today's conditions.

THE OSBORN MANUFACTURING COMPANY
5401 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.
Agencies Located Strategically All Over the World

TIME PROVES VALUES



OSBORN

MOULDING MACHINES

(*Concluded from page* 44)

more cooking outside the house seems to be steadily increasing in recent years throughout all sections of the country.

Officials of the Santa Ana Iron Works have prepared sets of blue prints showing various designs for out door fireplaces. They are prepared to supply estimates on costs and to recommend reliable contractors familiar with the building of the fire places. They maintain close touch with ornamental stone companies and with landscape gardeners with a view of opening new outlets for their products. Several typical fire place designs are shown in the accompanying illustrations.

According to D. G. Dearth of that company, the most popular size cooking plate for public parks and private gardens is the standard 18 x 28 inches. In the foundry particular care is taken to produce a straight, smooth, clean casting. For roadside stands and for special purposes the plate is finished on a surface grinder. In one design the plate has a solid top. In another this solid top is removable to disclose a grill for steaks and other items of food usually cooked in this manner. In a third and highly popular type one half the plate is solid and the other half is grilled.

Recently a new type grill has been added to the list. It is made like an old fashioned toaster with a grill in two parts hinged on a center rod. A steak, half chicken or other object is placed on one half. The other half is folded over to bring the two handles close together. The apparatus fits over the surface of the fire pit and can be turned from side to side as the cooking progresses. Castings in many instances sold individually include cast iron doors for clean out box, doors for firebox, grill plates and an oven 15 x 15 x 24 inches.

MANY COMPANIES MAKE CAST SOIL PIPE

By HERBERT H. FARR
Engineer
Sanitary Pipe Co., Alexander City, Ala.

STATISTICS of the soil pipe industry indicate that Alabama produces more soil pipe than any other section of the United States and that the city of Anniston can account for 60 per cent of that output.

John Foran from Port Chester, N. Y., supported by Boston capital went to Alabama about 50 years ago and erected the first southern soil pipe foundry at Pell City. This John Foran, the first southern soil pipe foundryman, was the grandfather of the well known Dick Foran, singing cowboy of the moving pictures. He also was the father of Col. Arthur Foran, state senator, Hunterdon county, N. J.

John Foran invented an apparatus for making green sand soil pipe cores, which was granted a patent in 1887. The fact that the device and method are still in universal use with practically no change over the long period of 52 years is a remarkable tribute to the ingenuity, skill and resourcefulness of that clever pioneer foundryman. The Pell City foundry was successful from the beginning, but Mrs. Foran did not like the South and as a result her husband abandoned the plant in 1892 and moved to Flemington, N. J. where he opened another foundry. That foundry still is in operation under the management of the son Col. Arthur Foran.

About that same period Anniston was developing into a pig iron production center and the Pell City plant was moved there and operated under the name Hercules Foundry Co. The venture did not prosper and failed after a short struggle. After a period of idleness the properties were acquired by the late E. L. Taylor who organized E. L. Taylor & Co. That company successfully manufactured soil pipe and fittings for about 3 years. Then the interests were taken over by the present Central Foundry Co. That company's operations immediately were profitable and soon outgrew the existing plant. A new and at that time a modern plant, later destroyed by fire, was erected at West Tenth street, Anniston.

In 1903, H. B. Rudisill with associates took over the controlling interest in a small jobbing foundry, the Adir Machine Works Co., at Addison and equipped it for the manufacture of soil pipe and fittings. Efforts were successful and the demands for cast iron soil pipe increased so rapidly that the plant could not supply the demand. Seven years later in 1910 he built a new and larger plant, still in operation as the Anniston Foundry Co. During the succeeding 10 years, 1910 to 1920, because of large building expansion and great war demands, soil pipe foundries sprung up all over the South. Besides those in Anniston, foundries were erected in Birmingham, Bessemer, Gadsen and Talladega in Alabama and in several other southern cities.

Compared to the amount required in some other industries, the capital outlay for a soil pipe foundry is small. At that period it was not difficult for a promoter to raise the necessary money to construct a crude wooden shed, put in a few pipe molding machines and start casting soil pipe. The promoters usually had connections with some other foundry and could borrow equipment and patterns to get a start. That accounts for the fact that all, or nearly all southern pipe foundries look alike and operate in practically the same manner.

Pipe Easy to Sell

In that connection, it is interesting to note the following statement taken from an article in the Sept 10, 1938 issue of the *Saturday Evening Post:*

"It is perhaps the strangest foundry in the world. Everything about it, even the power plant and smokestack seeming to have been created out of hand, without notes in an extemporaneous manner, as in fact it was. The work is in the same sign. They swing it. Nevertheless, with men, materials and tools involved in one great confusion a prodigious amount of work gets done. The first product was soil pipe. If you don't know, soil pipe is cast iron pipe flanged at one end, and is used by plumbers for conducting away waste and sewage. Why Soil Pipe? Because it was easy to make and would be always easy to sell, at a price."

Although the author was describing the foundry of the Sanitary Pipe Co., at Alexander City, his description applies fairly well to the other 62 plants in the United States. Some of his statements are not perfectly accurate, but soil pipe is easy to sell —at a price. Considerable amounts of money have been made and lost in the business. During the past few years more has been lost than earned. With the present over productive capacity no person can predict with any degree of accuracy what the future holds for those engaged in the industry. An industry that sticks to the same methods established nearly 50 years ago can-

(*Concluded on page* 49)

This article, and one by the same author appearing in the September issue of The Foundry, is abstracted from a paper presented before a meeting of the Birmingham District chapter of the A.F.A.

—The Editors

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not hope to survive, particularly under present economic conditions.

Except for a short recession in 1914 the soil pipe price curve rose sharply from 1910 and reached a peak in 1920. From that date the curve plunges downward and gradually has levelled off to a normal line which at present coincides with the foundry cost curve. According to statistics compiled by the Soil Pipe institute the most exceptional sales year was 1925 when 575,000 tons were produced and 540,000 tons were sold. At present 63 soil pipe foundries are in operation in the United States. If all were operated to full capacity they could produce 800,000 tons of soil pipe annually. This shows a surplus of 260,000 tons over the industry's best sales year.

Competitive substitutes for cast iron soil pipe have eaten deeply into the market. Unless the industry comes out of a lethargy and adopts more energetic sales and distribution policies, it can look forward to further restriction of the market. Manufacturers of cast iron pressure pipe, confronted more or less with the same problem, have been active in trying to solve it. They have gone a long way toward improving the quality of the product. Compared to pipe made 50 years ago, one hardly would recognize modern pipe as the same product. This greater branch of the pipe business profitably might extend their efforts to their modest cousins the soil pipe makers on the other side of the railroad tracks. Whether acknowledged or not, a direct relationship exists between pressure pipe and soil pipe makers.

Is Not Simple Process

Contrary to the snap opinion of the magazine writer quoted, the making of scil pipe castings is not quite as simple a process as he claims. All the work is done by hand and a considerable degree of skill and experience is required on the part of the operators.

He also is mistaken in claiming that the pipe is flanged at one end. Soil pipe is made with a hub at one end and a spigot at the other end. Certain sections are made with a hub at each end. Laying length for a single hub pipe is 5 feet, and for a double hub, 5 feet less the depth of one hub. Pipe is manufactured according to three weight specifications: Standard ⅛-inch wall thickness; medium 3/16-inch wall thickness and extra heavy ¼-inch thick

Standard pipe, the lightest grade, is produced and sold in greater volume than the others. Output of that grade is approximately 75 per cent of the total soil pipe volume. Medium weight pipe usually is shipped to foreign countries, for example to Cuba and the Philippine Islands. All three classes have the same internal diameter. External diameter is varied to secure the desired thickness and weight. Considerable saving by manufacturer and consumer could be effected if that practice could be changed. It would be a great deal more practical to do as the steel pipe makers have done. In steel pipe the outside diameter remains constant while the inside diameter is varied to get the proper weight and wall thickness. Interchangeability of each classification would be another advantage.

In the universal practice followed in molding soil pipe castings the patterns up to 6 inches diameter are mounted in pairs on a movable stripping plate machine. Six inch and larger sizes are mounted singly. Patterns are supported on cams, known as tumbling bars, connected to links actuated by a lever. After sand has been rammed either in cope or drag the patterns are dropped a short distance through the stripping plate before the mold is removed. This insures a clean lift.

Poured Through Four Sprues

The machine is mounted on wheels and travels on paths provided for the purpose. Runways usually are concrete faced with 2 x 12-inch plan. The machine follows the receding sand heap from one end of the floor to the other and the molds are laid down in a straight line so that the center of each flask will come directly under a monorail from which the pouring ladle is suspended. Each mold is provided with four sprues through which iron is poured from a four-lip ladle. Molders work in pairs. Sand is shoveled and rammed by hand. In some plants each pair of molders make the molds, pour them, shake them out and make their own cores. In other plants the molders simply make the molds while a third man makes the green sand cores and a separate gang attends to the shaking out and sand preparation. In one of the largest plants in the South the molds are rammed under a sand slinger.

Book Review

A. S. T. M. Specifications for Pipe and Piping Materials for High Temperature and High Pressure Services, paperboard, 128 pages, 6 x 9 inches, published by the American Society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $1.25.

This compact little volume makes available in convenient form all specifications of the American Society for Testing Materials relating to steel materials for high temperature service. It contains 18 specifications covering common steel and alloy steel pipe and tubing, castings, forgings, and bolting. Castings specifications cover carbon steel casting for valves, flanges and fittings, and alloy steel castings for valves, flanges and fittings.

Plans Program for F.E.M.A. Meeting

Preliminary plans for the program to be presented at the annual meeting of the Foundry Equipment Manufacturers' association at the Greenbrier hotel, White Sulphur Springs, W. Va., Oct. 6 and 7, have been announced. The meeting is expected to produce some extremely worth while data on questions confronting every equipment producer, including consideration of the business situation, labor supply, plans for an adequate quantity of raw materials for the future, and mobilization of the industry's strength under the most constructive plan. The meeting will give careful consideration to an appraisal of the business situation as each member finds it.

James R. Allan, International Harvester Co., Chicago, and chairman of the A. F. A. Industrial Hygiene Codes committee, will discuss certain phases of the dust hazard question with particular reference to equipment used in manufacturing establishments, especially foundries, in connection with which new developments dictate special consideration. C. E. Hoyt, executive vice president of the A. F. A., will discuss plans for exhibit of foundry supplies and equipment to be held in Chicago in connection with the annual convention of the association, May 6 to 10.

A golf tournament will be held Friday afternoon followed by a joint dinner of company executives and their ladies. W. R. Bean, vice president, Whiting Corp., Harvey, Ill., will talk on "Frewar Conditions in England and Europe." Mr. Bean recently has returned from 7 weeks in Europe. His contacts were principally with manufacturers engaged in the building of foundry equipment and with the users of foundry equipment in England, Scotland, France, Switzerland and Germany. In view of the recent developments his observations will be enlightening.

H. S. Hersey, vice president and general manager, C. O. Bartlett & Snow Co., Cleveland, is president of the Foundry Equipment Manufacturers' association, P. F. Potter, vice president, Pangborn Corp., Hagerstown, Md., is vice president and Arthur J. Tuscany is secretary. All manufacturers of equipment used in the foundry are invited to attend and participate in the discussions scheduled.

A MARKED change in average temperature recently reminded Bill that summer was gone. Man and boy he had seen the changing seasons for well nigh on to, well, for a good many years and he still could not reconcile his mind to the showing on the calendar where each season is allowed three months, no more, no less. The summer, he claims, is gone like the jet of a fountain, the foam on the river. The winter season drags along like the payments on a mortgage, or the unhappy young scholar observed by Mr. Shakespeare creeping rebelliously and at listless snail pace to school. "Three months!" Noticeable derision in rising inflection. "Three months indeed. If the calendar guy had to float around Lake Erie on a shingle for all the winter weather outside the regular three months, and if he survived—a happily doubtful contingency—we should have a new and a proper calendar."

"How would it be," I suggested, "If we were to start a one or two man movement to have a government bureau appointed to establish a new calendar?"

"Well," said Bill, "I'll tell you. If that suggestion had been made several years ago I should have considered it worth a trial. In the pitiful light of what government bureaus have accomplished in recent years, I am in favor of appointing a bureau to abolish all bureaus. They remind me of what the fella said about Columbus. Not Columbus, O., but the bird usually credited with discovering America. 'When Columbus set out,' this fella says, 'he did not know where he was going. When he struck land he did not know where he was at. After he got back home he did not know where he had been!' Purty good, hey?

"What can we do about it? Apparently nothing except grin and bear it and trust that eventually we shall blunder through the desert and come into the promised land. Not a very cheerful outlook. In the meantime those who are lucky enough to have a job must keep both hands on the plow handles and try to turn up as many furrows as possible in the daily 6 or 7 hours permitted by the lawful authorities. If we can scatter a few seeds of kindness and information so much the better for all concerned.

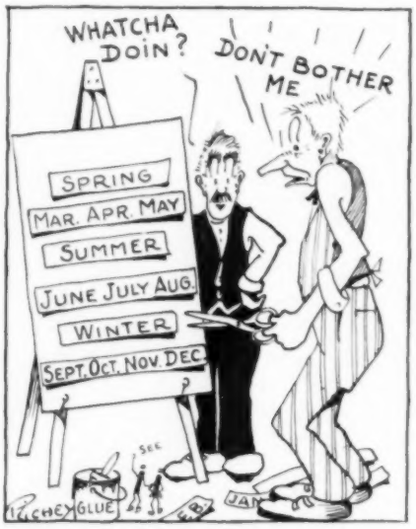
"I had a letter some time ago from a foundryman down in Mexico who writes a better letter in English than I could do in Spanish with the aid of three helpers and two English-Spanish dictionaries. He has a small foundry—fundidora to you—and is considering the idea of going into the manufacture of soil pipe castings. Listen to this:

I intend to make soil pipe 4 inches by 5 feet and connection, using green sand cores and intend to go at it on a small scale for lack of capital. I must make every cent I put in go as far as possible incurring into missteps as few as possible. I have no experience in that line, but there is no competition around here. I dispose of good hot iron melting conditions. Have my pattern set on a board, but it is a question of what kind of an arbor to make at the least expense and most efficient to produce casting at low cost. I have several ideas in my head, but I can't decide which one to try first. If the first one does not give results, I will have to try another and I can't afford to spend much money without results. On the other hand if I could go somewhere where they make them I could soon catch on, but I can't afford it, so I thought that maybe you could help me out. Just bear this in mind: I have the grit and small means, 20-inch cupola bringing 1½-ton per hour good and hot. I have large experience on machinery castings and some on stove practice, but these pipe arbors get my goat. I must use them for single and double bells and use them on both if more practicable. Please advise me as soon as possible best way to proceed, obliging yours very truly.

"I hope," I said, "you told him to keep away from soil pipe castings. Shops specially fitted up for the production of these castings hardly break even and yet for some peculiar reason many small jobbing foundrymen think they can enter the field and make some money. The same way with sash weights. I've had more correspondence over those things—"

"Well," said Bill, "I'll tell you. My first reaction to his letter was to tell him to lay off that stuff if he did not want to lose his shirt. However on second thought he undoubtedly knew the local situation better than I did, and presumably had given a subject serious consideration. He might not thank me for unsought advice. That is not so extraordinary either when you

(*Continued on page* 52)



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think of the lack of appreciation shown by the average person for advice eagerly sought and acted upon to the seeker's advantage. The only time any second reference is made to advice is when the advisee gets stuck in the mud and fails to profit by the offer of the friendly hand. Then you can hear him from here to Timbuctoo. After due consideration of the first and second thoughts I wrote to my correspondent as follows (Business here of rooting through half a dozen pockets for carbon copy).

Details the Process

"In the regular soil pipe making plants, the arbors for the straight pipe are stiff cast iron pipes, the same shape as the soil pipe castings, but with the outside diameter 1 inch less than the inside diameter of the pipe. This provides a space ½-inch thick for the coating of sand on the arbor. The arbors are machined for a short distance at each end so that they can be revolved in suitable bearings while the operator is applying the sand. The arbor is placed on the bearings where sand from a manually or mechanically agitated hopper falls a distance of 4 to 5 feet in a thin stream. This is the universal practice, but for limited production the sand may be pressed on the arbor by hand. One half is covered first and then the arbor is turned through an arc of 180 degrees and the second half is covered with sand in the same manner.

"The arbor may be revolved by a belt driven pulley or by hand. In some plants two men make all the cores for a number of molders. In other plants the men on each floor make their own cores. Where the core arbors are revolved by hand a wood crank is employed. A tapered plug at one end of the crank is pushed into the end of the arbor and held there by friction. The operator grasps a handle at the other end and revolves the arbor. The plug is readily engaged and disengaged. The arbor is claywashed and the sand falling in a constant stream from the overhead hopper gradually adheres until the thickness is slightly greater than is required. It is cut to the proper shape and size by a horizontal sweep resting on suitable supports and gradually moved forward until stops near the two ends engage the ends of the arbor. The wood sweep is reinforced with a thin strip of metal along the cutting edge.

Arbor Is Vented

"The arbor contains a row of small vent holes along the top. A small knob or other suitable mark on one end of the arbor serves as a guide for the man setting the core so that these vent openings are on top of the core as it lies in the mold. Sand is not the same in all sections of the country. In some places it is necessary to provide vent holes on the bottom and sides of the arbor. Determination of the bond and moisture content of the sand is very important and must be maintained within close limits. Where the sand is pressed on the arbor by hand a considerable degree of skill is required on the part of the operator. If the sand is not pressed firmly enough, it will drop off. If it is pressed too firmly the steam cannot escape rapidly enough, but will form blowholes and blisters on the casting. . Where the sand falls from a bin the height of the bin automatically determines the density of the sand on the arbor. For that reason a certain amount of experimenting is required at the beginning to set the bin at the proper height.

"In this connection it is rather interesting to note that this method of making green sand cores for soil pipe castings was developed by a clever foundryman named John Foran. He was granted a patent in 1887. The method was so simple and perfect that it is still universally practiced. No change or improvement has been introduced in a period of over 50 years.

"Where the pipes are made intermittently and in small numbers, another type of arbor may be employed. It is not as rigid as the tubular type and therefore not as reliable in the production of pipe with a uniform thickness. However, the tendency to *spring* when the core is surrounded with molten iron may be offset by placing a chaplet on top of a suitable bearing, or by deliberately *springing* the core in the opposite direction before it is placed in the mold. The bottom of the corebox departs slightly from a straight line and as a result the center section of the core is slightly closer to the bottom than the top. The pressure of the iron raises the core in the center and equalizes the thickness of metal.

Arbor Has Wings

"One advantage of this type of arbor is that it can be made in the foundry and does not require any machine finishing. It is a simple casting made up of a stiff central member with a number of semicircular wings at right angles and spaced about 3 inches apart. The wings occupy only the bottom half of the core, but the backbone extends an inch or more into the cope to increase the stiffness and prevent the core from springing to the extent of cutting off the thickness on the cope side of the pipe.

"A two part corebox is required with this type of arbor. The corebox may be hinged along the side or may be in two separate parts. In prac-

(*Concluded on page* 86)

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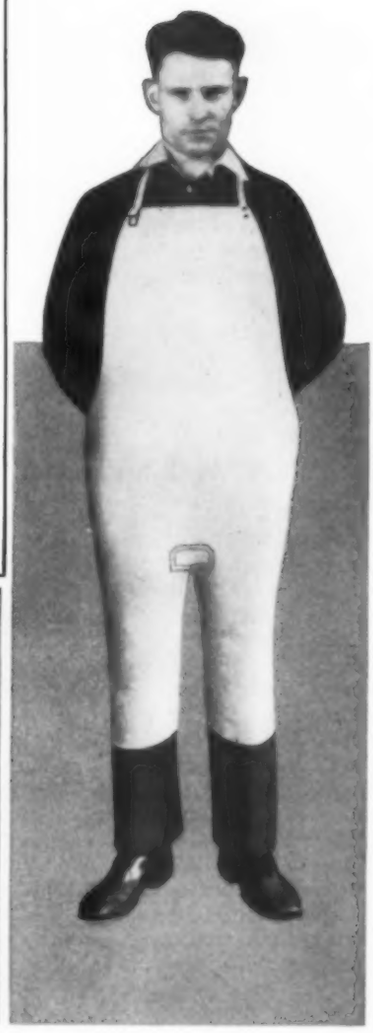

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New England

THE regular monthly meeting of the New England Foundrymen's association was held on Wednesday, Sept. 13 when advantage was taken of an invitation from the Mystic Iron Works to visit the plant at Everett, Mass. More than 200 members and guests were conducted through the plant operated by the Eastern Gas & Fuel Associates for the manufacture of pig iron and coke. The blast furnace is one of the few remaining units in New England. This visit coincided with one of the tapping periods and the foundrymen saw 100 tons of metal flowing from the furnace into ladles and then poured into an endless conveyor where it solidified into pigs.

From the blast furnace the tour continued to the nearby plant of the Warren Pipe Co., where cast iron pipe is made in a wide variety of sizes by the centrifugal process. Manufacture of coke was demonstrated and explained at the adjoining New England coke plant.

At the conclusion of the tour the visitors returned to Boston where a dinner was served at the general office of the Mystic Iron Works. The dinner was followed by a varied program of entertainment features. In the absence of R. J. Nelson, Arcade Malleable Iron Co., Worcester, and president of the New England Foundrymen's association, the chair was taken by vice president Francis LeBaron, E. L. LeBaron Foundry Co., Brockton, Mass. A large number of door prizes were awarded lucky ticket holders. Members and guests were welcomed by Mr. Thibeault, sales manager and vice president Mystic Iron Works. Charles Butler, Warren Pipe Co., commented briefly on several features in connection with the visit to the plant operated by his company.—*M. A. Hosmer, reporter.*

Pittsburgh

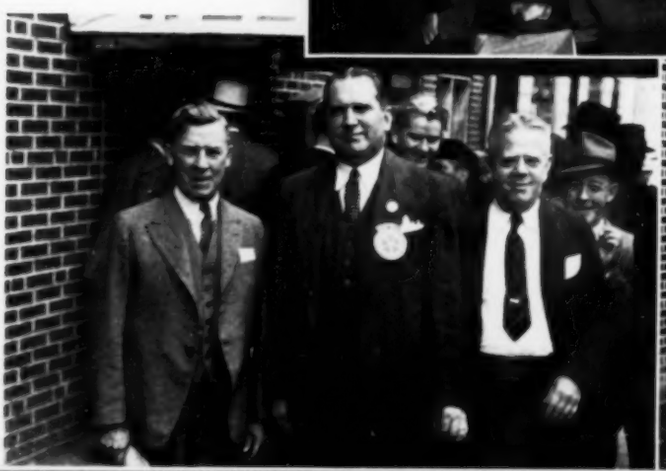
REGULAR monthly meetings of the Pittsburgh Foundrymen's association started Sept. 18, with the first speaker Leroy P. Robinson, Werner G. Smith Co., Cleveland. J. H. Johnston, Westinghouse Electric & Mfg Co., and president of the association, presided.

Approximately 80 members and guests heard Mr. Robinson's interesting talk on, "Variables in the Core Room, Their Treatment and

(*Continued on page* 57)

Philadelphia chapter went to Wilmington, Del. for outing and visit to Pusey & Jones Corp. and Eastern Malleable Iron Co. Photos courtesy W. B. Coleman, W. B. Coleman Co., Philadelphia

Left—Just before launching of lighthouse tender Mistletoe. Lower left—Smiling for the birdie. Lower right—In front of headquarters Hotel Grande



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Cure." The speaker made several controversial points which stimulated considerable discussion following the talk. Leader of the discussion was Walter White, Pittsburgh Rolls Corp. The attendance and activity of the discussion was gratifying and augurs well for another successful season.

Chairmen of standing committees were named as follows: R. H. Stone, Vesuvius Crucible Co., program; Walter H. White, Pittsburgh Rolls division, auditing; J. M. Stewart, Hickman, Williams & Co., entertainment; Harry D. Fowler, J. S. McCormick & Co., membership and attendance; H. B. Spilker, Sterrit-Thomas Foundry Co., executive committee.—*R. L. Hartford.*

Northern California

FIRST Fall meeting of the Northern California chapter of the A.F.A. was held Friday, Sept. 8 at Lake Merritt hotel, Oakland, Calif., and although it was the evening before two holidays, there was an attendance of 52. The speaker, Harry W. Dietert, Harry W. Dietert Co., Detroit, discussed, "The Sand in Your Foundry," and also distributed copies of his booklet on that subject to those present. At the close of the talk Mr. Dietert covered briefly the subject of hot strength of sand and cores.

The following day, Sept. 9, was Foundrymen's day at the Golden Gate International exposition. Invitations were sent to foundrymen from San Diego, Calif., to Vancouver, B. C. U. S. Steel Corp.'s exhibit in the Mines and Metals building served as headquarters for registration and reception and a large number of foundrymen visited the exposition on that day.—*George L. Kennard, secretary.*

Central New York

FIRST annual picnic of the Central New York chapter of the A.F.A. was held at Three Rivers inn, Three Rivers, N. Y., Aug. 26, with approximately 100 members and guests in attendance.

J. L. Lonergan, Leon E. Hall, and J. J. Jardine comprised the committee in charge of the arrangements and program. Softball, quoits, golf and fishing were sports available for those attending, and the fisherman had the usual excuse of the wind being from the wrong direction. Dinner was served at 5:30 at the inn.

Starting with the first fall meeting, Oct. 14, Frederick G. Sefing, International Nickel Co., will present a course in "Elementary Metallurgy" covered in a series of four lectures to be delivered at consecutive meetings.—*L. D. Wright, secretary.*

Detroit

LAST of the highly successful summer golf outings of the Detroit chapter was held Sept. 21 at Pine Lake country club, with the usual good crowd in attendance, including a number of guests in addition to the regulars always present at these social affairs.

Announcement of the chapter's meeting program for 1939-40 was greeted with interest because of the variety of subjects and authoritative speakers enlisted for the next eight monthly gatherings. Details are as follows:

Oct. 19: "Pattern and Molding Equipment," by Rex W. Jennings, general superintendent, Deere & Co., Waterloo, Iowa. Coffee talk on "Current Sports," by Ty Tyson, well known baseball radio announcer and sports commentator associated with *The Detroit News* and station WWJ.

Nov. 16: "Safety, Hygiene, Good Housekeeping and Occupational Diseases," by George W. Cannon and Dr. C. M. Colignon, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

Dec. 4: "Relationship between Hardness, Microstructure and Wear of Cylinder Bores and Rings," by E. K. Smith, metallurgist, Electro Metallurgical Co., Detroit; P. S. Lane, research engineer, American Hammered Piston Ring division, Koppers Co., Baltimore. (Joint meeting with Society of Automotive Engineers.)

Jan. 8: "Cast Automotive Products," by R. H. McCarroll, chief metallurgist, Ford Motor Co., Dearborn, Mich. (Joint meeting with American Society for Metals.)

Feb. 15: "Wet and Dry Cleaning of Castings," by Ronald Webster, Hydro-Blast Corp., Chicago, and Frank Pedrotty, American Foundry Equipment Co., Mishawaka, Ind. Coffee talk on "Manufacture and Processing of Kodachrome Films," by representative of Eastman Kodak Co.

March 7: "Multiple Cupola Melting for Various Grades of Iron," by Dr. James T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham, Ala. Coffee talk and sleight-of-hand demonstration

Connecticut Nonferrous Foundrymen's association holds a party. Photos courtesy Louis Tarantino, Niagara Falls Smelting & Refining Co., Bridgeport, Conn.

by Jack Lathrop, advertising manager, THE FOUNDRY.

April 12-13: Michigan State Foundry conference, Michigan State college, East Lansing, Mich.

May 16: "Merchandising of Castings," by R. G. McElwee, Vanadium Corp. of America, and chairman of the entertainment committee.—*A. H. Allen.*

Southern California

SECOND annual stag picnic of the Southern California chapter of the A.F.A. was held at the Lakewood Country club, Long Beach, Calif., July 29, and was attended by more than 300 foundrymen and friends. Games participated in by the group were golf, baseball, tennis, horseshoe pitching and general track and field events. Low gross in the golf tournament was won by Glen Waterbury, Alhambra Foundry Co. The horseshoe pitching contest was won by Jack Eberhardt, Kay-Brunner Steel Products Inc., who threw so many ringers that some of the boys thought he was using a magnet. The baseball game was between the Bare Kats and the Bone Krushers which turned out to be an exhibition of clowning and some real surprising plays. The game ended in a draw and was ably arbitrated by Glenn Merrefield, Warman Steel Casting Co., and Herman Young, Martin Iron Works.

Old gang music was furnished by Peter Valentine, Del Monte Sand Properties, and his traveling troubadours. Steak dinner in the early evening was followed by four boxing bouts which were highlighted by a professional exhibition by Bobby Seaman and Dick Kells, well known Pacific Coast boxers. That was followed by a 2-hour vaudeville show, awarding of athletic and door prizes, after which the fun lasted until the early hours of the morning. A photograph of those in attendance is reproduced on pages 36 and 37 of this issue.

The entertainment committee which arranged the affair is as follows: Chairman, W. D. Bailey, Pacific Metals Co.; Arthur Barker, Barker Foundry Supply Co.; George Emmett, Los Angeles Steel Casting Co.; Joe Brunner Jr., Kay-Brunner Steel Products Inc.; W. McLean, Snyder Foundry Supply Co.; C. E. Findley, A. P. Green Fire Brick Co.; Don McCrystal, Hercules Foundries, Inc.

Prizes for athletic events were donated by more than 30 local and Eastern firms in the foundry supply and metal industries.—*W. F. Haggman, secretary.*

Michiana

THE first outing staged by the Michiana chapter of the A.F.A. was held at the Christiana Country club, Elkhart, Ind., Sept. 16, with more than 200 members and guests participating. Some enjoyed golf while others entered the bait casting and horse shoe pitching contests, and others played baseball. Following the dinner, a short floor show was put on and everyone had a splendid time. W. A. Bachman, director of the chapter and foundry superintendent, New York Central Railway Co., Elkhart, was chairman of the committee in charge of arrangements.

Northeastern Ohio

CHAIRMAN, Ernest F. Hess, Ohio Injector Co., Wadsworth, O., welcomed approximately 140 members and guests to the first fall meeting in 1939 of the Northeastern Ohio chapter of the A.F.A. at the Tudor Arms (formerly the Cleveland club) Sept. 14. The program included a talk on the blast furnace by E. E. Pheneger, general superintendent,, Central furnace, docks and coke works, American Steel & Wire Co., Cleveland, and a magnificent movie picture in technicolor showing the evolution of steel from the ore to the finished product, presented through the courtesy of the United States Steel Corp.

Mr. Pheneger described the construction and operation of the blast furnace and the chemical reactions in converting the ore to pig iron. Function of the blast furnace is that of preheating the ores, reduction of the metallic oxides and melting the resulting iron and slag in one continuous operation in a vertical stack. Raw materials include ore, fuel, flux and air. To make one ton of iron requires approximately 2 tons of ore, 1 ton of fuel, ½ ton of flux and 4 tons of air.

A modern 700 tons per day blast furnace consumes approximately 63,000,000 cubic feet of air in each 24-hour period. The air is heated to a temperature between 1100 and 1500 degrees Fahr. and enters the furnace through the tuyeres near the bottom at a pressure of about 15 pounds per square inch. Daily water consumption on the furnace is about 11,000,000 gallons. Iron is tapped from the furnace at intervals of about 5 hours. Chemical analysis is made from a sample taken at each tap. Daily product of the furnace is 700 tons of iron and 345 tons of slag. In addition about 200 pounds of flue dust is collected for each ton of iron produced. Operation of the furnace and character of the slag exert an important influence on the character of the resulting iron.

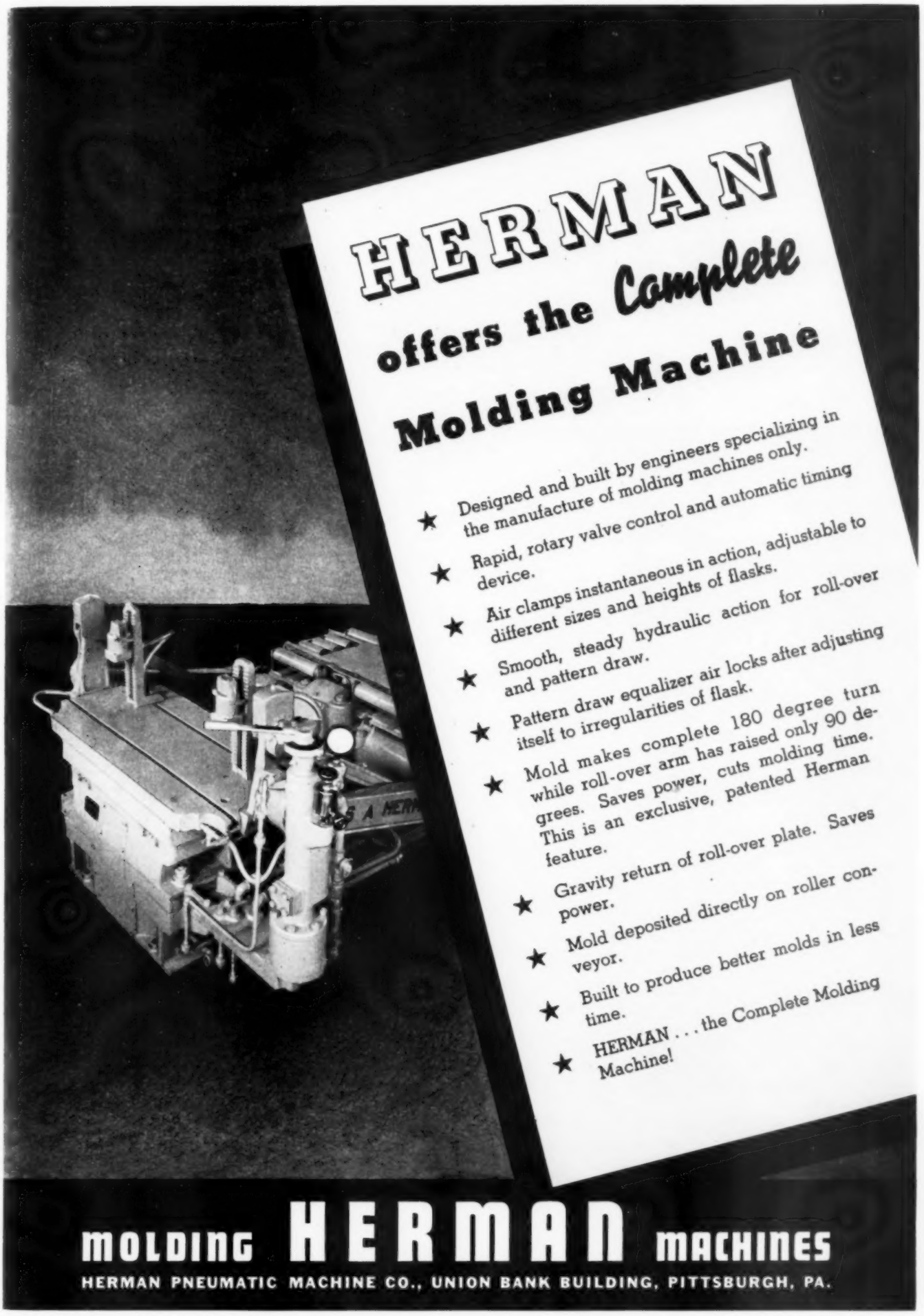
The picture "Steel—Man's Servant" with running comment by Edwin C. Hill, opened with scenes in ore mines, loading docks and freighters and continued through the unloaders, blast furnaces, bessemers and open hearths to the rolling mills making rails, rods, beams, plates and pipes.—*Pat Dwyer.*

Birmingham

ANNUAL picnic and barbecue of the Birmingham District chapter of the A.F.A., was held at Pineview beach, Saturday, Sept. 16. The picnic and barbecue this year was in the nature of a celebration of the rapid progress and national prom-

(*Concluded on page* 60)

Group of the officers of the Southern California chapter photographed at the recent outing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(*Concluded from page* 58)

inence attained by the local chapter during the past years.

In addition to a number of events held, there was a colored boxing match, refereed by Casey Jones of Attalla, Ala., which was enjoyed by all. A record attendance of around 450 was made up of local and out of town foundrymen as well as their friends. Much credit is due R. L. Ogden, Stockham Pipe Fittings Co., and his committee, who put forth every effort to make the event a successful one.

The first meeting of the Fall season will be held Oct. 13, at the Tutwiler hotel with dinner being served at 6:30 p.m. and the business session beginning promptly at 7:30 p.m. The subject for the evening will be on "Foundry Practice," consisting of four 15 minute talks on each of the following: Malleable, gray iron, nonferrous, and stove foundry. W. D. Moore, American Cast Iron Pipe Co., Birmingham, will talk prior to the technical session.

A special chapter meeting will be held in Chattanooga, Tenn., Friday, Oct. 20. Headquarters to be at the Read house. Program for this occasion to be as follows:

9:30 a.m.	Registration.
10:00 a.m.	Plant visitation.
12:30 p.m.	Luncheon.
2:00 p.m.	Round table discussion, "Cupola Practice": Gray iron, nonferrous and steel foundry.
4:00 p.m.	Technical session on, "Grinding in the Foundry."
6:30 p.m.	Dinner.

The local chapter invites all foundrymen and their friends to attend the Chattanooga meeting.—*Farrar Hill, chairman publicity committee.*

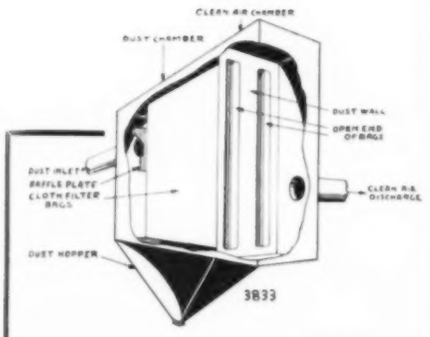
Program Arranged For Baltimore

Baltimore's first regional conference, to be held at the Lord Baltimore hotel on Oct. 20 and 21, will provide an interesting program for foundrymen of the Maryland, Virginia and District of Columbia area. The conference committee under the direction of Chairman Paul S. Lane, American Hammered Piston Ring

(*Concluded on page* 62)

The Birmingham District chapter held a very successful barbecue on Sept. 16

1874 SIXTY-FIVE YEARS OF SUPPLYING EQUIPMENT FOR EFFICIENT FOUNDRY OPERATION 1939



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Sly Purair Helmets protect workmen from the effects of dust, fumes, gases and vapors. Equipped with shatter-proof glass window, they permit clear, safe vision.

Made of aluminum and light, flexible, seamless rubber, they are adjustable to all body types and sizes, fitting closely over shoulders, chest and back.

These helmets are approved by the U. S. Bureau of Mines, Approval No. 1911. Complete equipment consists of: belt and air supply hose between belt and helmet, air purifier and filter, pressure regulator, pressure gauge and 15 feet of hose and fittings.

DURABLAST ABRASIVE

Sly Durablast Shot and Grit contain no graphite. They can be used over and over again by removing, after use, dust fines and coarse refuse which retard cleaning action. Their combined hardness, toughness and weight result in economical blast cleaning.

Durablast Shot consists of round grains, carefully screened into many sizes.

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(*Concluded from page* 60)

division, Koppers Co., Baltimore, has arranged technical sessions on cupola practice, bronze melting, alloy and high test irons, cement molding, sand, gating and risering, refractories, and steel castings. In addition to the meeting several foundries in the district will be open for inspection although no formal or large group visitations will be undertaken. The tentative program is as follows:

Friday, Oct. 20

9:30 a.m.—Opening meeting—Registration and reception. Address of welcome, by S. J. Cort, Bethlehem Steel Co. Response, by Robert E. Kennedy, secretary, American Foundrymen's association.

10:30 a.m.—Cupola practice—Gray iron shop course. Chairman, Max Kuniansky, Lynchburg Foundry Co. Speaker, D. J. Reese, International Nickel Co.,

10:30 a.m.—Bronze melting problems—Nonferrous shop course. Chairman, H. B. Gardner, Nonferrous Ingot Metal institute. Speaker, Roger Keeley, Ajax Metal Co.

2:00 p.m.—Alloy and high test cast irons—Gray iron shop course. Chairman, Paul S. Lane, American Hammered Piston Ring division, Koppers Co. Speakers, V. A. Crosby, Climax Molybdenum Co., and R. G. McElwee, Vanadium Corp. of America.

4:00 p.m.—Cement molding—Steel and gray iron. Chairman, J. E. Crown, Naval Gun Factory. Speaker, J. C. Pendleton, Newport News Shipbuilding & Drydock Co.

8:00 p.m.—Sand—Gray iron, nonferrous and steel. Chairman, C. M. Saeger Jr., Bureau of Standards. Speakers, W. G. Reichert, American Brake Shoe & Foundry Co., and H. W. Dietert, H. W. Dietert Co.

Saturday, Oct. 21

10:00 a.m.—Gating and risering—Gray iron and nonferrous. Chairman, C. L. Frear, Bureau of Engineering, Navy department. Speakers, Max Kuniansky, Lynchburg Foundry Co. on gray iron. Nonferrous speakers to be announced later.

12:30 p.m.—Cupola maintenance and refractories — Round table luncheon. Chairman, C. E. Bales, Ironton Firebrick Co. Discussion leaders, D. J. Reese, International Nickel Co., and A. V. Leun, Bethlehem Steel Co.

2:00 p.m.—Steel—Feeding and desulphurization. Chairman, H. F. Taylor, Naval Research Laboratory. Speakers, H. D. Phillips, Lebanon Steel Foundry, and George S. Evans, Mathieson Alkali Works.

4:00 p.m.—Conference closes.

Plant Visitation

American Hammered Piston Ring division, Koppers Co.—gray iron and bronze; Bartlett-Hayward division, Koppers Co.—manganese and high test bronze; Gibson and Kirk Co.—brass and bronze; Flynn & Emrich Co.—gray iron, bronze and aluminum; James J. Lacy Co.—gray iron, bronze and aluminum; Rustless Iron & Steel Corp.—stainless steel and alloy steels.

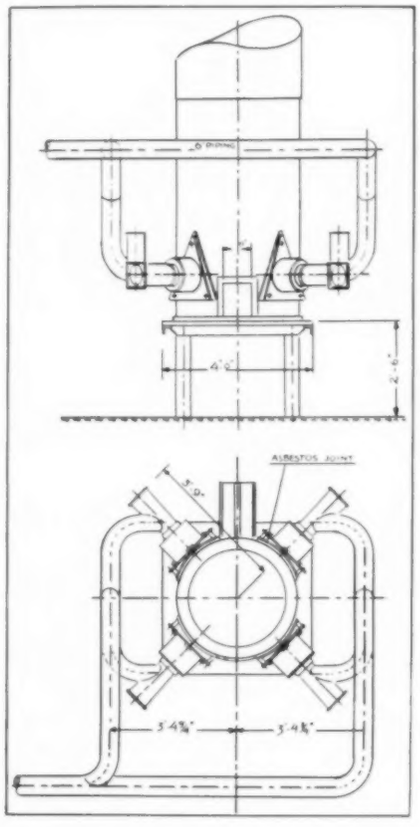
Due to renaming of streets, the address of the United Compound Co., Buffalo, recently was changed to 328 South Park avenue.

Provides Shutters On Cupola Tuyere

The accompanying illustration shows the principal features of a small cupola recently installed in Australia to take the place of one which had been in constant service for 27 years. Before deciding on the features of a new cupola, an extensive study was made of published literature on the subject by West, Moldenke, Kirk, Hurst and of many scattered articles by various writers in THE FOUNDRY. The resulting cupola constructed by a local engineering firm is a composite of the ideas of many men.

Air for the cupola is supplied by a positive pressure blower driven by a 15-horsepower electric motor and geared to melt 3 tons of iron per hour. The usual heat is only 3000 pounds and is melted in 35 minutes. The charge is made up of pig iron and return scrap with a coke to iron ratio of 1 to 5. Practically all the castings are light and the iron must be very hot from the beginning to the end of the heat.

Instead of a wind belt around the cupola, a special device, which may be described as an air box is attached to the shell at each of the four tuyere openings. Branch pipes from a single main 6-inch blast pipe conduct the air to these air boxes. A sliding shutter at the outer end of the air box extension provides a means for regulating the blast pressure and volume at any of the four tuyeres. This feature is a variation of the revolving shutter shown in an article in THE FOUNDRY Dec. 1, 1929, dealing with a specially designed cupola for melting bronze.



Individual blast pipe is attached to an expansion chamber of air box outside each tuyere

In practice the shutter is opened to the limit when the cupola is lighted approximately an hour before the blower is started. The natural draft thus provided promotes uniform burning of the coke inside the cupola and heats the charge to a considerable extent. First metal appears 5 minutes after the blower is started. No fluxing material is required on the short heats we run. The air box becomes quite hot and heats the air on the way into the cupola.

Should one of the tuyeres become black during the melting period, the shutter is opened about 3 inches. This creates a back draft and the hot gas from inside the cupola, rushing out through the tuyere, rapidly raises the obstructing material to a white heat. If necessary the procedure is repeated on the other tuyeres, one at a time. It would be interesting to learn if the practice could be continued over an extended period. Unfortunately our short melting period does not supply this opportunity.

Book Review

The Chemistry Formulary, by H. Bennett; cloth; 638 pages, 5½ x 8½ inches; published by the Chemical Publishing Co. Inc., and supplied by THE FOUNDRY, Cleveland, for $6.00

This new 1939 edition provides a great amount of useful information, the boiled down essence of the latest methods of hundreds of chemists, engineers, technicians and professors. It shows not only ingredients and quantities to use, but explains the steps in the production of the finished material. The book contains thousands of formulas and receipts for making innumerable products for use in the factory, office, home and school.

Contents cover adhesives, beverages, cosmetics and drugs, emulsions, farm and garden specialties, foods, inks, leather, lubricants, materials of construction, paints, paper, photography, plating, polishes and abrasives, pyrotechnics, rubber, resins, plastics, waxes, soap and cleaners, textiles and fibers, miscellaneous, references and acknowledgements, trade named chemicals and sources of supply, where to buy chemicals, supply sources outside the United States. A 24 page index is a valuable addition.

ADVERTISING PAGES REMOVED

FOUNDRY DEVELOPMENTS AT SHORT RANGE

RECENT development of the United States Rubber Co., New York, is the perfection of an iron electrodeposition or electroforming process whereby dense, solid iron molds containing extremely sharp impressions are obtained. The electrodeposited iron is in the form of a shell about ½-inch thick which may be backed up later for use with a cast iron or steel case. The process is being applied for making intricate molds for automobile tires, molds for plastics, core boxes for foundry use, etc.

* * *

Protection of iron pots used in melting aluminum alloys can be obtained according to one author by painting them with a compound mixed to a creamy consistency which contains 5 pounds of water glass, 5 pounds of French chalk and 1 handful of salammoniac.

* * *

A recent article describes the use of various pickling agents to secure satisfactory surfaces on copper base alloys, and mentions the use of anhydrous ferric sulphate with sulphuric acid as a dip. The application is mainly for removing scale formed on annealing wrought brasses and bronzes, but there is the possibility that some progressive nonferrous founder might be willing to do a little experimenting to find out whether it has any application in the foundry.

* * *

Cast aluminum alloys ordinarily are comparatively low in elasticity. However, two have been developed which without heat treatment show elongations of 10 and 18 per cent. In addition the alloys are claimed to have suitable hardness, high tensile strength, resistance to oxidation and corrosion, fine grain, and special machining properties. One alloy, according to the patent, contains 0.20 per cent titanium, 1.75 per cent copper, 1.50 per cent tin, 0.75 per cent zinc, 0.90 per cent magnesium, 0.25 per cent chromium, remainder aluminum, and showed a tensile strength of 29,900 pounds per square inch with an elongation of 10 per cent. The other containing 0.15 per cent titanium, 1.50 per cent copper, 1.25 per cent tin, 1.75 per cent zinc, 0.40 per cent magnesium, remainder aluminum, showed a tensile strength of 23,000 pounds per square inch with an elongation of 18 per cent.

* * *

EFFECT of a combination of graphite and silicon or zirconium on gray cast iron is greatly different than the action of each separately according to a patent. The combination is said to refine the grain and graphite flakes in heavy sections, reduce or eliminate chill, raise tensile and transverse strength without greatly altering ductility or hardness of the main body, etc. Preferred combination is 50 per cent graphite intimately mixed with 50 per cent ferrosilicon, (85 per cent grade) and from 4 to 8 ounces are used per 100 pounds of gray iron.

* * *

A newly developed cast iron containing substantial amounts of chromium with a high silicon content is said to possess high hardness with excellent machinability, resistance to scaling and growth, and also resistance to wear. Composition according to a patent ranges from 3.0 to 10.0 per cent silicon, 0.6 to 8.0 per cent chromium, 0.2 to 3.0 per cent manganese, and 1.80 to 3.20 per cent total carbon. Some of the iron had a brinell hardness of 417, but was claimed to be machinable without difficulty.

* * *

ACCORDING to an English author old abbey green color on copper and brass can be obtained by applying a paste containing 2 ounces arsenious oxide, 12 ounces of ammonium chloride, 12 ounces verdigris, 4 ounces of basic copper carbonate, and 1 gallon of muriatic acid. Apple green is obtained with a solution containing 20 ounces of sodium chloride, 16 ounces of ammonia water, and 1 gallon of water. Antique green results from application of a solution containing 12 ounces copper sulphate, 2 ounces of ammonium chloride, and 1 gallon of water.

* * *

Latest in substitute materials or *Ersatz* in Germany, according to a recent patent, is use of steel wool, thin steel or iron scrap for part of the coke in cupola melting. Steel wool seems to be preferred due to its small cross section and large area, and it is mixed with the coke. It is claimed that 40 to 50 per cent of the coke can be replaced by 30 per cent steel wool. That substitution is said not only to reduce sulphur content, especially with poor coke, but also to effect a saving of 19 to 23 cents a ton in melting cost. To show the efficacy of using steel wool with the coke an example is cited of a 1980-pound charge ordinarily requiring 198 pounds of coke which was melted with 99 pounds of coke and 33 pounds of steel wool. Ten charges were melted with no apparent difference in melting and iron temperatures of 2480 to 2514 degrees Fahr. were obtained.

* * *

SILICON, an extremely harmful impurity in high lead bronzes, sometimes may be detected by appearance of the molten metal showing dark patches of dross continually rising to the surface. When castings are removed from the sand, the surface will be rough and coated with a white siliceous material as though whitewashed, and lead sweating will occur. Fracture of such metal is golden to red brown, dendritic and usually with a separation of the metal along the length of the casting.

* * *

In certain types of malleable iron castings it has been found that shearing the gates removes metal rapidly. In many cases it is claimed that the metal saved offsets the productive labor required for shearing. Rapidity of operation also is a factor in shearing since 15,000 to 20,000 gates can be sheared before sharpening the knife or repairing the anvil.

ABSTRACTS

FROM WORLD LITERATURE

Estimate and Cost

A Few Notes on Estimating and Costing, anonymous, *The Engineer and Fountryman*, Johannesburg, South Africa, July, 1939.

This article gives a brief description of the procedure followed in a South African foundry to estimate production costs of castings upon which inquiries have been made. Those figures of course, are derived from work previously performed, and upon which accurate data are available. The latter are actual costs, and the method of obtaining them are described.

Copper-Aluminum

Reversible Transformation in the Cu-Al Alloys Containing Between 7 to 16 per cent Aluminum. (Sur la transformation renversable dans les alliages cuivre-aluminum entre 7 pour 100 d'Al), by Andre Boutillier, *Comptes Rendus*, Paris, France, 208, 1939.

A dilatometric study of the copper-aluminum alloys shows the existence of a reversible transformation of the hardening constituent which is made manifest by irregular dilatometric anomalies. The results lead to considering the dilatometric anomaly corresponding to the reversible transformation as resulting from the superposition of a regular anomaly of change of state and a variable anomaly due to numerous factors and depending on the form and dimensions of the specimen, size, orientation of the crystals of the beta-solution, thermal heterogeneity, etc. These factors in the first transformation determine the texture of the hardening constituent in the cold state and the dilatometric behavior of the specimen. Later these factors do not show any appreciable effect during the course of the subsequent transformations. They are numerous enough so that two specimens are never identical.

Metal Coloring

Modern Metal Colouring, by Charles Harris, *The Metal Industry*, London, England, June 9, 1939.

In this article the author describes the three general methods for obtaining colors on metals which include chemical, heat and electro coloring. Information is presented on methods of obtaining certain colors on various copper alloys, nickel, steel, tin, chromium, aluminum, cadmium, and magnesium alloys.

Malleable Iron

The Open Hearth Furnace for Melting Malleable Cast Iron, by G. R. Shotton, *Foundry Trade Journal*, London, England, July 27 and Aug. 3, 1939.

In the beginning of this discussion the author points out that he is not drawing a comparison with other better known types of melting units, but rather is setting out his accumulated experiences of design and operation of the open hearth furnace. Information is given on the design and construction of the furnace, regenerator, maintenance, gas producer, etc. Data also are given on operation of the furnace, melting losses, fuel costs, and total operating costs. Total melting cost according to the author on the basis of 110 tons per week is 9s. 0.1d per ton, and on 88 tons per week is 10s. 5.9d which figures out to $1.96 and $2.28 per ton (2000 pounds) respectively.

Permanent Molding

Aluminum Gravity Die Casting, by J. J. Mills, *The Metal Industry*, London, England, June 23, 1939 and July 7, 1939.

This article describes at length the procedure employed in manufacturing several types of automobile castings by the permanent mold process. Metal is melted in three open flame holding furnaces and one crucible tilting furnace and transferred to crucible furnace for use. Alloy employed after some experiment to determine the most suitable for a variety of castings contains 4 per cent silicon, 2 per cent copper and 2 per cent nickel. Materials for molds is gray iron containing a small amount of chromium with the following analysis: Carbon, 3.2 to 3.4 per cent; silicon, 1.8 to 2.0 per cent; manganese, 0.8 to 1.0 per cent; sulphur, about 0.06 per cent; phosphorus, 0.25 per cent, and chromium, 0.20 per cent. In addition to those points information is presented on gas inclusion, die design, and other features.

Cupola Blast

Optimum Blast Volume for Cupola Practice, by Nicolas Czyzewski, *Foundry Trade Journal*, London, England, July 13, 1939.

The author presents a number of formulas on cupola combustion which show that the maximum blast for cupola operation is 100 cubic meters per square meter per minute (about 328 cubic feet per square foot) when good foundry coke equal to 9 to 11 per cent of the charge, and normal charges are employed. He points out however, that use of poor coke, high superheat of iron, etc. will require a change in maximum blast required.

Melting Cast Iron

A New Cupola Melting Method (Ein neues Kupolofenschmelzverfahren), by Wolfgang Zoeller, *Die Giesserei*, June 30, 1939.

The new melting process mentioned by the author hardly can be termed that since it concerns use of the hot air blast. The method of obtaining the hot air differs somewhat from those previously described in that the heat exchangers are located in the stack above the charging door with a restricted passage or opening just above the door. However, the main body of the article is devoted to information on numerous heats melted with and without the hot blast to show the advantages obtained through the former. Data show increase in physical properties, higher temperature of iron, reduction in sulphur content, and reduction of coke consumption.

Aluminum Alloys

Nonferrous Foundry Practice—XXVI—The Aluminum Alloys, by J. Laing and R. T. Rolfe, *The Metal Industry*, London, England, July 14, 1939.

Continuing the discussion of aluminum alloys, this article is concerned with those containing appreciable amounts of magnesium pointing out that in the United States and Great Britain magnesium-aluminum alloys in chief industrial use contain approximately 4 and 10 per cent magnesium; the first being used as-cast, and the second after heat treatment. The article presents tables giving compositions and physical properties of the various alloys and discusses other phases such as the constitutional diagram, effect of other constituents, etc.

Foundry Practice

Nonferrous Foundry Practice (XXV—The Aluminum Alloys—Continued), by J. Laing and R. T. Rolfe, *The Metal Industry*, London, England, June 2, 1939.

This is another in a series of articles prepared by the authors on nonferrous foundry practice and is a continuation of the discussion of aluminum alloys. It discusses the equilibrium diagram for aluminum-silicon alloys, modification process with the high silicon alloys, properties of high silicon alloys, low silicon alloys, complex alloys and their heat treatment, etc. Tables are included which give data on composition and properties.

Alloying Cast Iron

Nature and Stability of Some Special Cementites. (Nature et stabilite de quelques cementites speciales) by A. Portevin, Paul Bastien and Leon Guillet Jr., *Comptes Rendus*, Paris, France, 208, 1939.

The authors give the results of their study of the influence of the addition of boron, cerium, cobalt and titanium on the properties of cast iron. The curie point varies linearly with the proportion of the element added and the latter forms a solid solution in the carbide phase. In the case of boron, two distinct carbide phases are formed. Small additions of cerium and boron exert a pronounced increase in hardening power, whereas large additions of titanium and cobalt cause relatively little increase. Of the four elements mentioned, only cobalt exerts an appreciable effect on the temperature of beginning of graphitization, but does not appear to exert any influence on the thermal expansion. On the other hand, thermal expansion is influenced considerably by the other three elements, being increased by titanium the graphitizing element and decreased by the hardening elements, boron and cerium.

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EXPEDITES CORE PRODUCTION

By A. M. KERR

MAKING foundry cores is an exacting operation which calls for skill and adeptness. While manufacturing cores on a production basis is not practiced universally in the foundry industry, the accompanying illustrations show an outstanding example of production core making as practiced in a western Pennsylvania foundry.

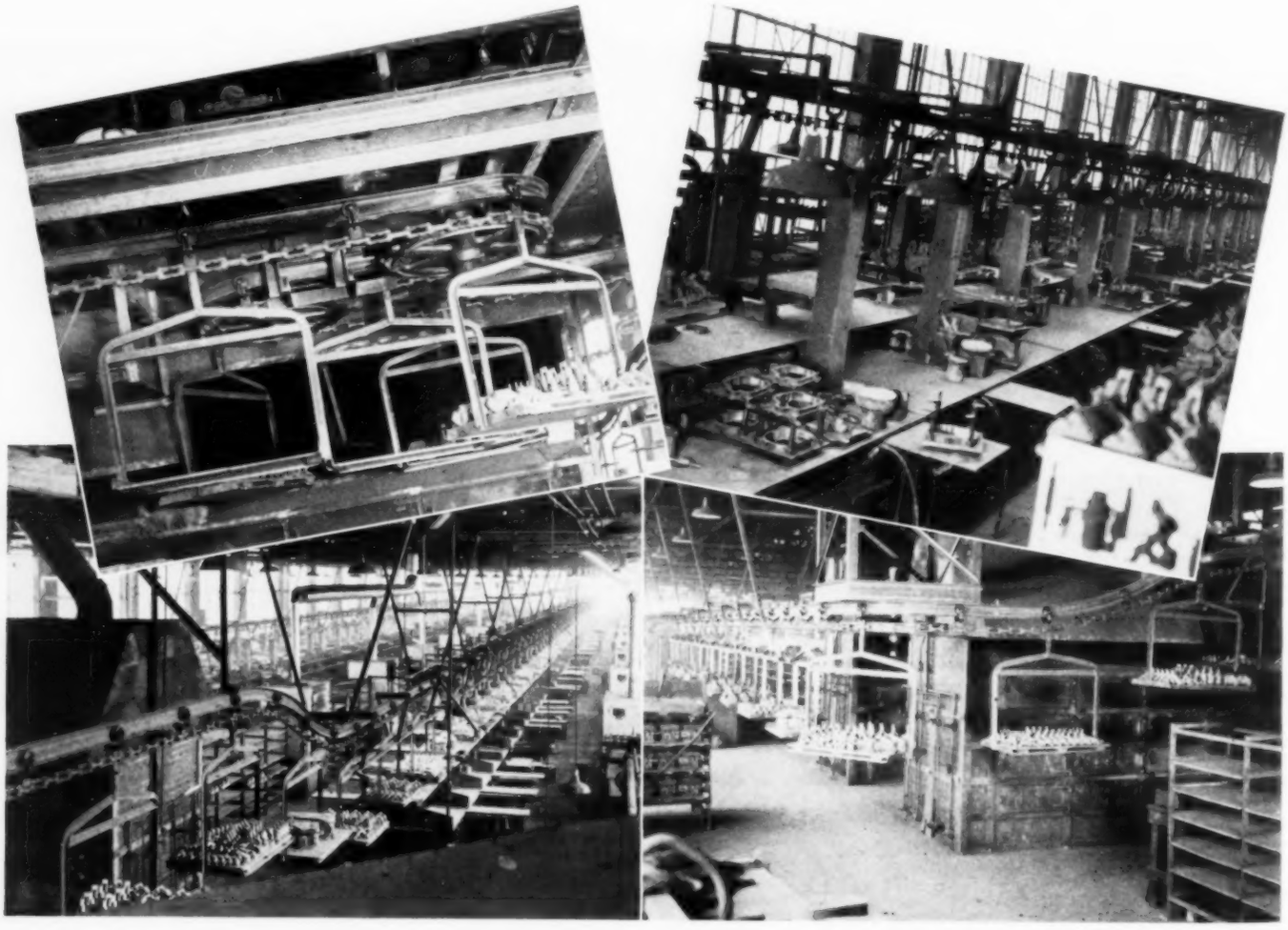
One of the most important features of the system was elimination of confusion, lost motion, and unnecessary traffic due to manual handling. Results accomplished in the short period of 2 months after installation include the complete organization of the department, where each coremaker has only his job to do. Materials pass his station continuously, operations are uninterrupted and increased production with resulting economies are apparent.

The primary element making such results possible has been the installation of a trolley conveyer. Fig. 2, a general view of the core-making department, shows the trolley conveyer on both sides of the room, and passing between core makers benches. Steel trays on hangers spaced equal distances apart, are suspended from chain attachments, which in turn are connected to ball bearing trolley wheels traveling on an I-beam track at pre-determined speeds.

Fig. 3, a close-up illustrates the manner in which the trolley conveyer, with its suspended trays of supplies, passes between the parallel rows of core makers benches. Auxiliary equipment is shown including the core ovens underneath the work benches. Oven flues extend above the light fixtures. Fig. 4 shows a 90 degree corner and an inclined section, used for gaining elevation, usually to secure head room over aisleways.

The trolley conveyer is approximately 600 feet long, end to end, and is equipped with grease packed trolleys. Individual trolleys, consisting of two trolley wheels and brackets, are spaced apart on 32 inch centers, and operate on a 4 inch I-beam track. The driving mechanism consists of a 2 horsepower motor, a variable speed control with a ratio 4 to 1, a v-belt drive to a gear reducer, to spur gear and pinion. Variable speeds from 4 to 16 feet per minute can be secured. The drive and take-up are arranged conveniently on one structural frame, thus making it possible to reduce the amount of slack in the trolley chain immediately after it leaves the slack side of the driving sprocket. This construction is featured in Fig. 1. The sprocket in the foreground is the driven sprocket, and the one in the background the idler or take-up sprocket.

Fig. 1 (Top Left)—Drive and take-up sprockets are arranged on one frame. Fig. 2 (Bottom Left)—General view of the trolley conveyor. Fig. 3 (Top Right)—Close-up view. Fig. 4 (Bottom Right)—Corner and inclined section. Illustrations through courtesy of Mathews Conveyer Co., Ellwood City, Pa.



REMOVE RISER HEADS THE QUICK INEXPENSIVE WAY *by* AIRCO *Machine Gas Cutting*

The Unitcast Corporation, midwest steel foundry, formerly removed large risers from steel castings with a hand-cutting torch. It was an expensive job and a full day's work to remove three 14 x 26 inch risers.

After a consultation with Airco engineers, the management tried an Airco Radiagraph. With this oxyacetylene cutting machine, three risers of the same dimensions were removed in about 35 minutes — at a third of the cost. Observe how the finished cuts were smooth and clean. This practically eliminated the usual costly grinding operations.

Airco Flame Cutting is the modern, economical method of cutting steel. Why not investigate this Airco process further? It may show you the way to improved products, increased production, or lower manufacturing costs. Write any Airco district office for full information.

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PROPPING CUPOLA BOTTOM DOORS

By MARTIN B. CHAMARA

CONVENTIONAL type of props under large cupola bottom doors consists of two or three solid steel bars erected vertically after the doors are hoisted into place. Considerable time is required to set these props in place. Due to the necessity of using a sledge hammer the work of setting the props or removing them may be dangerous. In many cases the prop remains in the drop and is either damaged or destroyed. The type of employe usually engaged in removing the drop is not inclined to exercise much discrimination.

Salient feature of the method shown in the accompanying illustration, is the construction and manipulation of the center member, the prop which is removed last. The outer two props in various adjustable forms have been used by several foundries for a great many years. The majority still use solid props; the kind to which they have been accustomed for many years.

The bottom doors and cupola base ring are rough castings. When the doors are hoisted into place, the props support not only the weight of doors and free content of the cupola but also the super load which in most cases is more than twice the weight of the doors and free content of the cupola. The combined load is responsible for the difficulty ordinarily experienced in pulling the center prop before the bottom doors are dropped. This applies particularly to hand manipulation.

In the method shown the super load is removed from the center prop before removing the two end props. This is accomplished by turning the adjusting screw one turn inward. After the end props are removed the center prop supports only the weight of the door and free content of the cupola, and consequently can be pulled easily by cable or chain attached to a crane, winch, truck or tractor without danger to any person.

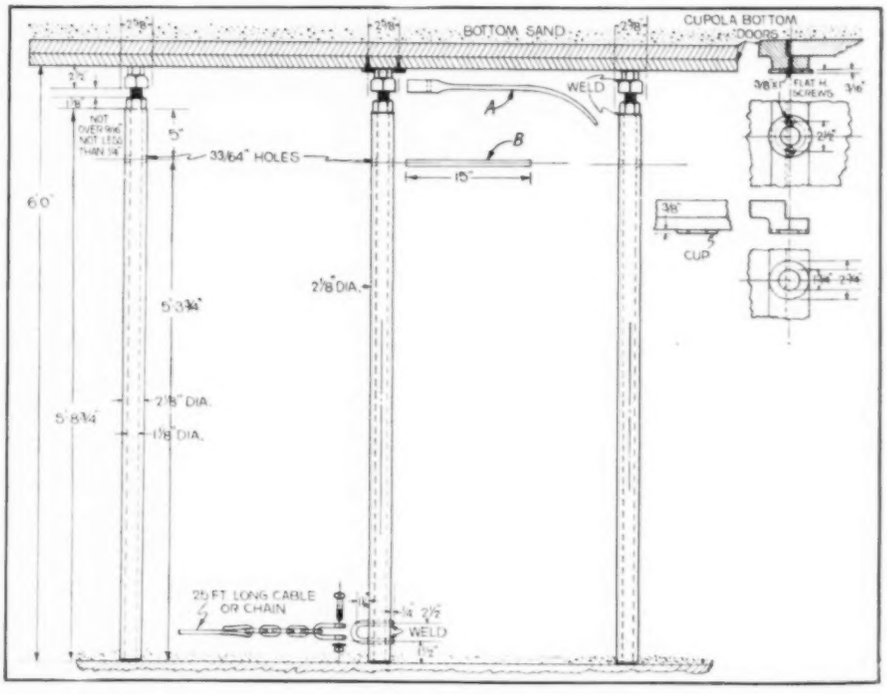
Before adopting this system, usually it was necessary to replace one prop per week when two cupolas were operated. The present system has been used for 1½ years and no prop was lost in that period. Previously, due to danger involved, the men dreaded propping up the doors or dropping the bottom. The new system has developed a feeling of safety. No one was ever injured or burned by the drop since the new method was adopted.

Flat steel washers are attached to the bottom of the door to prevent the prop from creeping. These washers are needed only on existing doors. Where new doors are made the prop retaining cups are cast in the flange of the door as shown at center right in the accompanying illustration. Method of attaching the washers to the ordinary type door is shown immediately above.

Gives the Dimensions

Dimensions given are for a cupola where the distance from the foundation plate to the bottom door is 6 feet. For every 12 inches increase in this distance the diameter of the props should be increased ¼-inch. In the example shown for a 96-inch shell diameter cupola, the props are seamless steel tubes 1⅛-inch inside diameter, 2⅛-inch outside diameter.

After the doors are hoisted into place the props are adjusted truly vertical and the nut on top is screwed up tight with the heavy duty open end wrench *A*. The handle on the wrench is bent as shown to prevent the workman's knuckles from coming in contact with the door casting. The steel bar *B* is inserted in the drilled hole in the prop and held with one hand to prevent the prop from turning while proper adjustment is made.



Before dropping the bottom the central prop nut is released one turn. The outside props then are removed after which the central prop easily is pulled by a chain or cable at the bottom

Book Review

Basic Features of Welding Technique (Grundzuege der Schweisstechnik), by Theodor Ricken, paper, 63 pages, 6 x 9 inches, published by Julius Springer, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland.

This work which is printed in German, is designed to give to engineers and others concerned, a review of the present status of the entire welding technique, and point out its application possibilities. The book is divided into eight chapters including an introduction to the subject. Chapter II discusses welding in which pressure is employed such as forging, butt welding, and spot welding. Chapter III briefly describes thermit welding while chapter IV is concerned with gas and arc welding methods. Planning, estimation, and execution of welded structures is discussed in chapter V, and the special fields of welding technique are dealt with in chapter VI. Testing of welded seams and cost estimation for welding are described in chapters VII and VIII.

Industrial Management society of Chicago will sponsor a national motion and time study clinic at the Medinah club, Nov. 3-4. The event will be similar to that held last year. Headquarters are at 205 West Wacker drive, Chicago.

ADVERTISING PAGES REMOVED

Watch Melting Loss In the Cupola

By Robert Grimshaw

Iron melting loss is caused partly by oxidation of some of the silicon and manganese in the iron. Loss from oxidation of carbon in the iron is neutralized partly by carbon absorbed from the coke. The amount of sulphur taken up from the fuel, where this is sulphurus, is trifling.

Shrinkage, although no very considerable percentage of the metal charged, is a direct, positive loss. Even the smallest percentage on the immense sums represented by pig iron melted in a large foundry, should be kept to the lowest possible figure. On $600 worth of pig iron, approximately 30 tons, the difference between 5 per cent and 6 per cent shrinkage is $6.00 a day; in 280 days' run, $1680, which is 6 per cent interest on $28,000.

In most cupolas shrinkage could be cut one per cent by watching, recording, analyzing the factors involved and acting on the results of the analysis.

When any person claims his melting loss is 3 per cent I doubt it very much. If he were to say 5 per cent or any other even percentage, I would say the same thing; because I would know he had calculated it roughly, hence loosely—if indeed he had not just guessed at it. If he said 3.75 or 4.87 or 5.03 per cent I could be reasonably sure that he had at least calculated it, and could then only entertain the possibility that he either had used incorrect data or made a mistake in calculation. An even per cent of melting loss happens but once in a long time. Watch the shrinkage figures!

Welfare Work at an English Foundry

Welfare at Stanton is the title of an attractive booklet recently issued by the Stanton Ironworks Co., Ltd., near Nottingham, England and presenting in text and illustration many features of interest in connection with the operation of the company. The firm operates its own blast furnaces and mines and employs 14,000 people, skilled and semiskilled artisans and craftsmen, furnacemen, molders, miners, engineers, carpenters and general laborers. A number of women are employed as nurses, cooks and canteen attendants and several hundred office employes of both sexes. Matters affecting the welfare of all employes are dealt with by a committee on which the management and employes are equally represented.

The company maintains eight fully equipped ambulance stations staffed by 18 state registered nurses. An institute and extensive recreation grounds afford the employes every facility for enjoying indoor and outdoor sports and pastimes. The canteens are used not only for meals, but also for meetings, dances and band rehearsals. Young employes are given every encouragement to qualify for positions of greater responsibility by attendance at evening classes. The company defrays the cost of tuition, traveling expense, books and stationery.

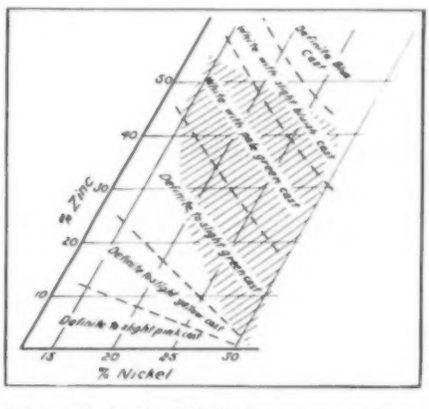
Concluding pages in the book show stages in the centrifugal method of pipe casting in which the company was a pioneer, immense stacks of various types of pipe in the stock yard, concrete pipes made by the centrifugal process, reinforced concrete lamp posts and roads surfaced with slag from the blast furnaces.

Book Review

Etching Handbook, (Aetzheft), by Angelica Schrader, cloth, 24 pages, 5¾ x 8¾ inches, published by Gebruder Borntraeger, Berlin, Germany, and supplied through THE FOUNDRY, Cleveland and in Europe by the Penton Publishing Co. Ltd., London.

This volume, which is printed in German, is by one of the authors of that well known work "Atlas Metallographicus" which is noted for its excellent micrographs. While the present volume contains only 24 pages, it is amazing that so much information is presented within those confines. Essentially, as might be expected, the information is boiled down to its briefest terms, and the arrangement of the material in two columns on a page makes it extremely easy to use. In the column arrangement, the column at the left names the particular operation such as specimen preparation while the column on the right describes in detail, briefly and concisely, the procedure to be employed.

Materials covered are iron and steel, cast iron, special steels, rustless steels, aluminum and aluminum alloys, antimony, lead and lead alloys, gold and precious metals, copper and copper alloys, magnesium and magnesium alloys, nickel and nickel alloys, silver and silver alloys, tungsten, zinc and zinc alloys, tin and tin alloys. In addition, part of the text is devoted to general comments on specimen preparation, a table showing differences in appearance of various structural components of ferrous materials with various etching agents, and a detailed table covering the same features for intermediate crystallization in aluminum alloys.



Colors of simple nickel-zinc-copper alloys. Shaded area indicates sensibly white alloys

Gives Compositions For Grave Markers

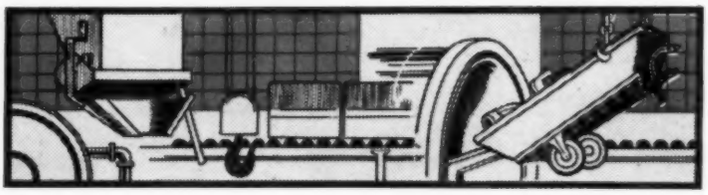
By John Anthony

Rapid increase in demand for cast bronze grave markers is attributed to application of aesthetic principles to cemetery design. Uniformity and appropriateness of such markers contribute dignity, simplicity and beauty to their surroundings. Essential qualifications of metal markers are similar to requirements for ornamental bronze statuary, plaques and architectural castings. These include faithful reproduction of fine detail and high resistance to weathering and atmospheric corrosion.

One composition with a pleasing red color which is being used successfully for ornamental castings contains 86 per cent copper, 2 per cent tin, 2 per cent lead, 8 per cent zinc, and 2 per cent nickel. Relatively high zinc content facilitates production of sound castings through its deoxidizing action. Nickel and zinc improve fluidity and aid in filling all parts of the mold cavity so that design detail is reproduced. Nickel also improves the color and corrosion resistance. Low lead content is said to promote development of an attractive patina after prolonged outdoor exposure.

When a white color is desired, nickel-silver casting compositions offer advantages. Their resistance to corrosion is somewhat superior to the usual brasses and increases with nickel content. After prolonged exposure without cleaning, a soft brown or green patina develops which protects the surface against pitting and further corrosion. A practical composition for metallic white castings contains 60 per cent copper, 20 per cent zinc and 20 per cent nickel. A moderate range of subdued color tints can be produced by adjustment of copper, zinc and nickel contents as indicated in the chart at the left.

NEW EQUIPMENT . . .



AND SUPPLIES

Sand Conditioner

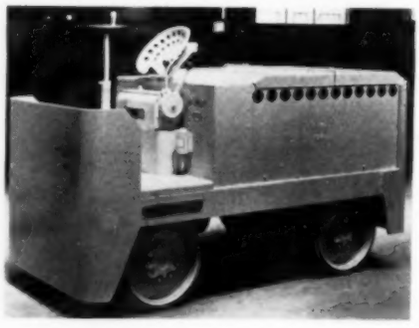
Royer Foundry & Machine Co., 158 Pringle street, Kingstown, Pa., maker of sand conditioning machinery, portable and stationary in a wide range of sizes and capacities,

has redesigned the various units to reduce weight and height. The company also has developed a junior type model, shown in the accompanying illustration, for use in small foundries. This small machine, mounted on a single pneumatic tire wheel, has a capacity of 150 to 250 pounds of sand per minute in removing sand contamination, breaking lumps and clay balls, blending and mixing old and new sand, distributing moisture through the heap, increasing pereamibity, aerating and cooling the sand. The unit weighs only 270 pounds equipped with a totally enclosed 110 to 220, volt single phase, 60 cycle, 1750 revolutions per minute motor, starter switch cable and plug.

Electric Tractor

Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland, has developed a heavy duty tractor, shown in the accompanying illustration. The tractor has an ultimate draw bar pull of 5000 pounds and has four wheel drive and four wheel steer. Drive controller is of the four speed, heavy duty, horizontal double drum, fully enclosed type. Power circuit is shut off when operator leaves seat. Controller allows for dynamic brakes to provide safe operation on ramps. Power circuit may be applied fully before releasing brake to accelerate on ramps.

Drive axles are equipped with 500 per cent over load, heavy duty and high torque motors, direct connected to free coasting worm and gear. Drive units are supported at three points to compensate for floor irregularities in every direction and to relieve the frame of strains. High and rigid bumpers protect operator and tractor. It is claimed that the tractor is especially adapted to



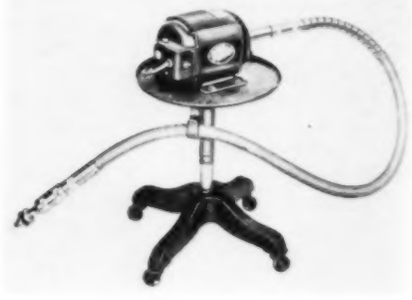
hauling heavy loads on trailers in steel mills, foundries, etc.

Conveyor Idler

Chain Belt Co., Milwaukee, has developed a ball bearing idler for handling materials of medium weight. It is suitable for conveyors in widths from 14 to 30 inches. The idler rolls are 4-inch smooth finished steel tubing with formed heads pressed into and welded to each end. The heads are ball bearing, equipped with effective sealing against dust and dirt by a combination labyrinth and composition seal. The rolls are round and smooth to prevent injury to conveyor belt and may be removed readily and quickly. High pressure lubrication is provided for either or both ends of the idler through button head grease fittings. Troughing idler rolls are supported in strongly ribbed malleable iron brackets. Brackets in turn are supported on an inverted angle base, definitely self cleaning with no shelves or pockets for dust accumulation.

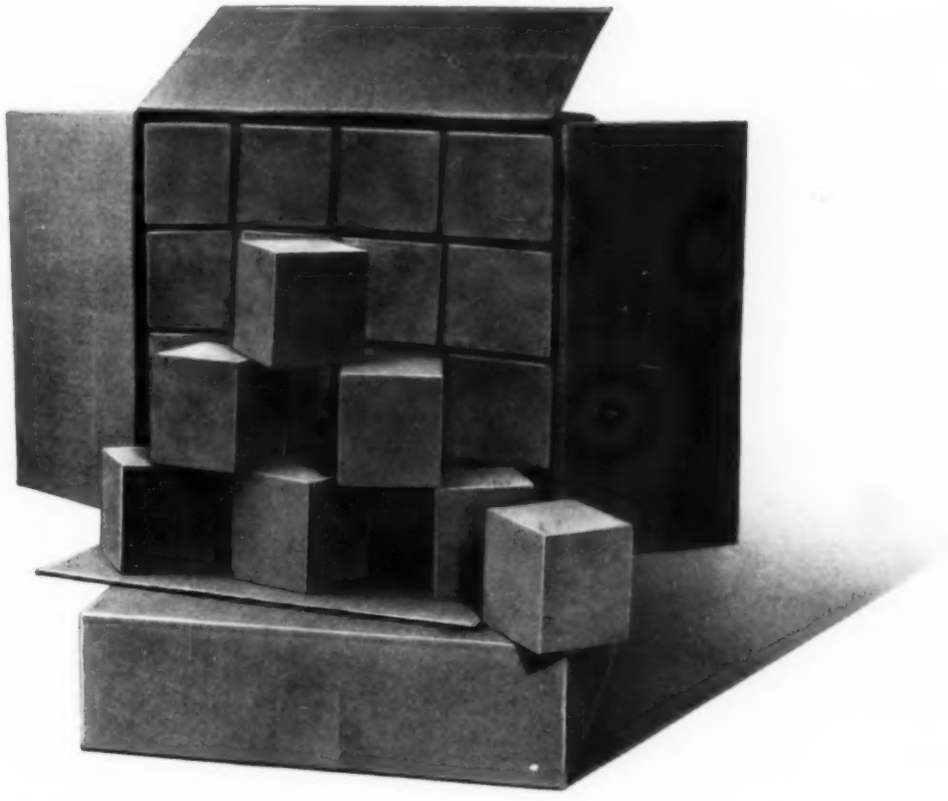
Flexible Shaft

Stow Mfg. Co., Inc., Binghamton, N. Y., has developed a new line of flexible shaft tools for grinding, polishing, buffing, rubbing, wire brushing, sanding, filing and drilling operations. First of these machines, pedestal type, shown in the accompanying illustration, incorporates motor, extension cord and plug, flexible shaft and clamp spindle. Connection may be made with any lamp socket. Mounted on a 4-leg metal base with ball bearing casters the unit is steady and may be pushed about easily. The pedestal is adjustable in height and maintains low center of gravity with resulting good balance even in extended position. The machine is provided with a convenient tool tray. Standard attachments of that



company used on the heavy duty machines are specified on the smaller machine. Motors are supplied ¼, 1/3 or ½-horsepower with choices of two speeds 1725 or 3450 revolutions per minute.

"FERROCARBO" IMPROVES GREY IRON
in five important ways!



IN 1933 "Ferrocarbo" was introduced to the grey iron foundries by The Carborundum Company as a simple and economical means of processing irons to obtain increased strength, toughness, Brinells and grain refinement and to improve machineability.

That these claims for the material were justified is indicated by the steady climb in shipments for each succeeding year.

Hundreds of foundries report that the use of "Ferrocarbo" either in briquette form as a cupola addition or as grain for ladle and furnace additions has reduced their steel costs, improved the quality of their castings and reduced rejections materially.

All types of iron have been processed with "Ferrocarbo" satisfactorily—it is being used by all types of foundries both large and small.

There is an interesting story in the development and use of this Carborundum contribution to the science of metallurgy—a story that may help you in your constant efforts to cut foundry costs.

Complete information and literature can be obtained from listed branch offices and distributors.

REFRACTORY CARBORUNDUM PRODUCTS

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THE CARBORUNDUM COMPANY, REFRACTORY DIVISION, PERTH AMBOY, N. J.

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District Sales Branches: Boston, Chicago, Cleveland, Detroit, Philadelphia, Pittsburgh. Agents: McConnell Sales and Engineering Corp., Birmingham, Ala.; Christy Fire Brick Company, St. Louis; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Co., Los Angeles, San Francisco, Seattle; Denver Fireclay Co., El Paso, Texas.

Distributed by Kerchner, Marshall & Co., Pittsburgh and Cleveland; Miller & Company, Chicago, St. Louis and Cincinnati.

(Carborundum and Ferrocarbo are registered trade-marks of The Carborundum Company)

Respirator

Willson Products Inc., Reading, Pa., announces a new low resistance twin filter respirator for protection against both type *A* and lead dusts. The device, shown in the accompanying illustration, employs a small rubber, form fitting face piece designed to permit wearing of goggles or spectacles without visual interference. Two filters, each with 30 square inches filtering surface, minimize breathing resistance.

Fan Coating

Autovent Fan & Blower Co., 1805-1827 North Kostner avenue, Chicago, has developed a new treatment for its acid moisture proof and vapor explosion proof propellor fans, claimed to increase the protection of fans against corrosion and explosion. The fan wheels are given multiple coats of the protecting material bake finished at a temperature of 375 degrees Fahr. Tests indicate that this treatment affords protection from corrosion. Acid moisture proof fans are heavy gage steel powered by fully enclosed round body motors. Where conditions are less severe the fan wheels are coated with bakelite lacquer. Vapor explosion proof units have fan wheels of copper, brass or other nonferrous metal.

Portable Grinder

Independent Pneumatic Tool Co., 600 West Jackson boulevard, Chicago, has introduced a new rotary air grinder for small wheel work. It is claimed the small size and light weight, 5½ inches in length and 18 ounces in weight, make it easy to handle even on the most delicate precision work. Operating at a free speed of 14,000 revolutions per minute the device may be used with a wide variety of accessories, abrasive wheels up to 1½-inches diameter, rotary files and steel cutters, sanding disks, wire brushes, saw blades, buffing and polishing wheels. Additional advantages claimed for the tool include the ability of holding a nearly constant speed under load with virtually no power waste, low air consumption simplified design which reduces wear and cost of maintenance. Standard equipment includes a push button throttle which may be locked for continuous operation, and ¼-inch collet and swivel hose connection. Lever handle may be had in place of push button and the adaptor for collet may be replaced by an adaptor with chuck.

Unit Bins

Noggle Products Co., Ann Arbor, Mich., recently has introduced the bin assembly shown in the accompanying illustration, and designed to keep track of small miscellaneous parts required in the manufacture, installation and servicing of all kinds of mechanical equipment. The system of unit bins is sold separately and assembled by the user to fit his individual needs. The bin housing may be screwed to a wall or bench, a cupboard or to a panel fashioned into a portable kit. A bin may be opened for removal of a single item. It is so delicately balanced that it closes automatically when the hand is removed. If lifted slightly when open it will lock in that position. Lifted higher, pulled out and down it will remain open for cleaning. It may be removed entirely from the housing. In some instances the device is mounted on either side of a vertical board, provided with a wood base and a handle and carried to the job as a tool kit. The units are available in two sizes. The 3-inch bins are 2½ inches deep, 3 inches high and 3, 6 or 9 inches wide. The 4-inch bins are 3-inches deep, 4, 8 or 12 inches wide.

A new mold dressing is claimed to double the life of pots, ladles, ingot molds, etc. used for aluminum, brass and white metal.

Sliding Grille

Made of galvanized chain link mesh but also obtainable in aluminum or stainless steel, if desired, the sliding grille is a flexible steel curtain hung from an overhead track. Cornell Iron Works Inc., Thirty-sixth avenue and Thirteenth street, Long Island City, N. Y., manufacturers of this sliding grille, claim that it will nest at the side of a door in a space less than 1/6 of the door width.

Galvanized vertical rods are used to hang the grille from a supporting track above. This sliding grille is claimed to be so designed that it will travel around a sharp curve and lie at right angle to the door if there is at least 10 inches room available. Stock size is 10 x 12 feet but other sizes are available. The grille is claimed to give adequate protection against entry while admitting plenty of light and air.

Aluminum Reflector

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has developed a new bay aluminum reflector, shown in the accompanying illustration, and designed for use with incandescent lamps for general lighting of high bay areas in foundries, machine shops, receiving and shipping departments, etc. It is stated that the locklite principle of attaching industrial reflectors applied to this unit speeds installation, reduces maintenance and provides increased safety with interchangeability of reflector units.

Each unit consists of two parts, a hood and a receptacle into which the reflector with lamp holder fits. When the lugs on the neck of the reflector lock into the slots of the hood, the electrical connection is made, by giving a reflector a clockwise turn of 60 degrees. The lamp will not light until the reflector is locked in the hood. A counter clockwise turn releases reflector and lamp for cleaning and replacement.

SPO TALKS PRACTICALLY

CONSOLIDATE YOUR GAINS

One war is always going on. It is continuous, vital, intensifying. It is *the struggle for business.* Your competitors never cease looking enviously at your business and hoping to take it away.

How do you propose to hold your customers? There is just one way: to give them such solid satisfaction that they will have no desire to place their orders elsewhere. *You can hold your business only by deserving it.*

Right now, more than ever before, it is imperative that your facilities be all they can be and hence should be. Is your equipment able to cope with an expanding volume at a profit? The wrong machine may be costing you far more than the purchase price of the right machine. Obsolescence has no place in your production line today.

The four castings at the right stand for as many situations in which the SPO staff has been privileged to aid in increasing output, lowering costs, and improving the product. May we help you *consolidate your gains?*

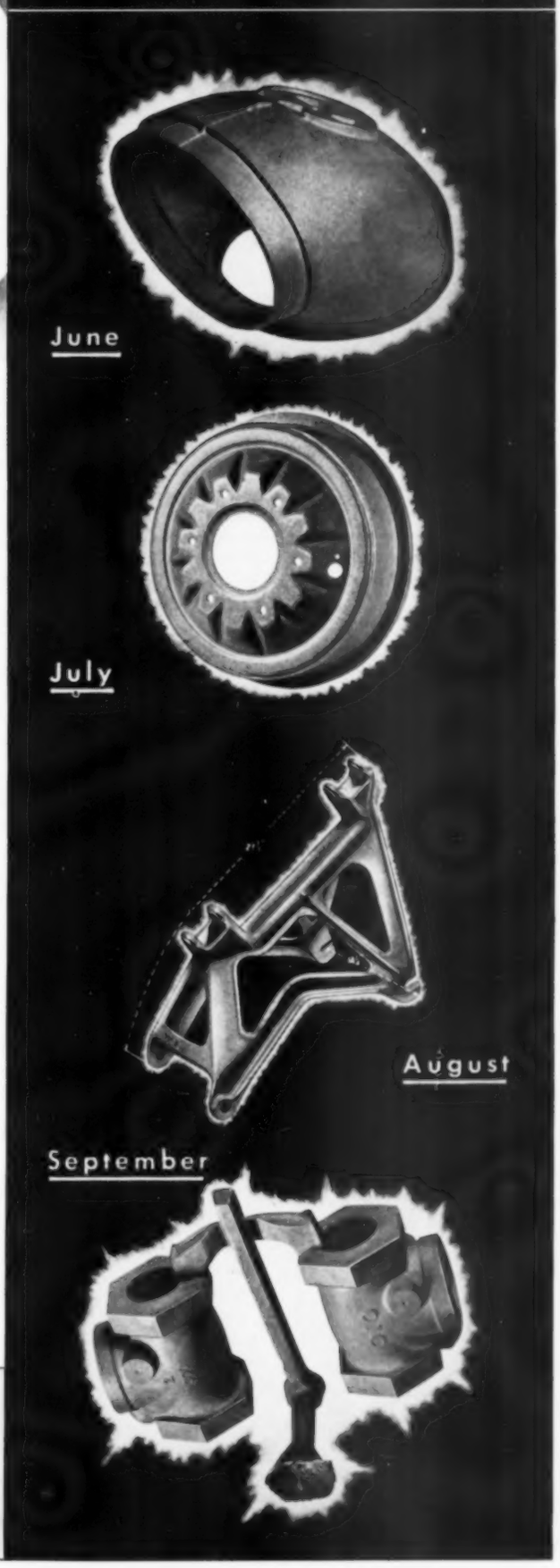
SPO designs and builds both molding machines and pattern equipment, and guarantees them unconditionally to produce castings which will be in accordance with your specifications.

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators, and Patterns for Production

East 61st St. and Waterman Ave. Cleveland, Ohio

"Consolidating" our present series of advertisements, we picture below four castings which are now being made better and at a better profit as a result of SPO cooperation ... May we serve you likewise?



Portable Blower

Clements Mfg. Co., Chicago, has developed a 2-speed electrically driven unit which may be employed as a blower or as a suction cleaner. At high speed the velocity of the

air is 26,000 lineal feet per minute and the capacity 176½ cubic feet per minute with a wattage input of 890. At low speed the velocity is 20,500 lineal feet per minute and a capacity of 125 cubic feet per minute with a wattage input of 670. The unit, shown in the accompanying illustration, has a sand-cast aluminum housing, single cast aluminum fan, statically and dynamically balanced, heavy duty cable for positive grounding, and low torque on starting from low speed switch.

Welding Helmets

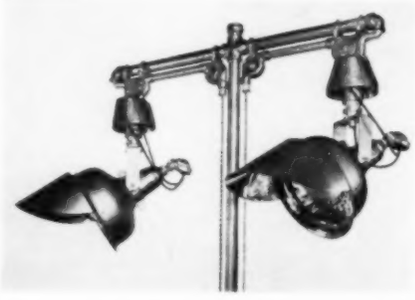
American Optical Co., Southbridge, Mass., recently has introduced four new welding helmets and four new hand shields. It is claimed these devices are made of vulcanized fiber, either in one piece or fabricated construction, designed for comfort, safety, convenience and durability. Helmets have a free floating headgear, and an outside friction joint. Three types of glass holders are available. An exclusive feature to be noted in these holders is that which hold the welding and cover glass flexibly instead of rigidly in position, to cushion the shock if struck accidentally. Glass readily may be changed without smudging or risk of breaking.

Gas Analyzer

Hays Corp., Michigan City, Ind., recently has developed an automatic flue gas analyzer cased in a transparent plastic. The new unit, smaller, more compact and lighter in weight is housed in a stream lined, steel case along with a draft measuring unit. A flue gas thermometer also may be had to fit inside the case. The instrument employs the principle of volumetric measurement and chemical absorption. The operator pulls a small rod on the side of the case, aspirates the gas sample by a rubber bulb and pushes in the rod. The percentage of CO_2 is indicated on a dial in front of the case. Usually the instrument is wanted with a draft measuring unit and flue gas thermometer. A two-unit model also is available for CO_2 and O_2. The device finished in gray lacquer with chromium trim weighs 12 pounds.

Lamp Accessories

Thompson Electric Co., 1101 Power avenue, Cleveland, has expanded its line of lamp lowering hangers, lamp shock absorbers and related accessories, partly shown in the accompanying illustration. New equipment may be used as readily and as successfully with flood lights as with reflector units. Other claims include protection against dirt and corrosion, and the wide range of models providing a selection to fit almost every combination of wiring, mounting and operating conditions.



The shock absorber, a vibration arresting device to protect the lamp filaments has been re-engineered. New models with a wide variety of spring tensions have been introduced.

Face Shield

Boyer-Campbell Co., Detroit, recently has placed on the market a new type of face shield which may be adapted to meet three different sets of conditions, as shown in the accompanying illustration. When fitted with the special window in clear, light, medium or dark green, or amber, it is claimed that the shield is ideal for spot, flash and gun welding, buffing, polishing, wire brushing, die casting, or protection from flying scale. When fitted with wire screen window it affords protection to the operator engaged in babbitting, or exposed to flying sparks or metal. In the third form, the fiber front and glass holder affords protection in acetylene welding, burning, scarfing, etc. The windows are buttoned on the fiber forehead guard. A leather

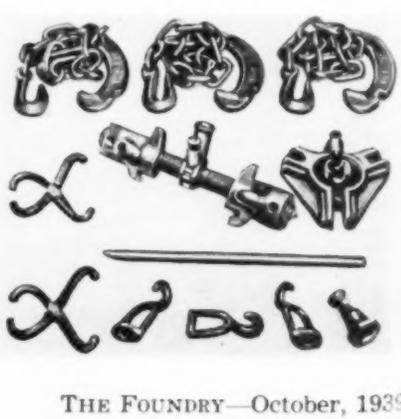
sweat band backed by wool felt keeps perspiration out of the eyes. Windows are aluminum bound to permit individual fitting and may be worn with or without correction glasses. When not in use the window can be tilted upward. In that position it protects the eyes from over head glare.

Toggle Clamp

Detroit Stamping Co., West Detroit, Mich., has developed a new toggle clamp with built in air cylinder. The clamp is said to be particularly useful on fixtures requiring multiple clamping operations, and one air valve will control and operate several clamps. It also may be used for clamping operations in inaccessible places. It is claimed that the new operated toggle clamps offer a speed far in excess obtained with hand operated clamps used for various operations.

Tool Kit

Templeton, Kenly & Co., Chicago, has developed a utility tool kit containing many pieces of equipment used in various combinations to perform a wide variety of jobs on production, construction and maintenance work. The outfit shown in the accompanying illustration is delivered in a compact metal carrying case with complete instructions and suggestions for use. Applications include: Spreading and pulling together structural members or any movable objects within its 10-ton capacity; pushing, hoisting; lifting; lowering; clamping; bracing; and tensioning. Can be used for removing gears, wheels, pulleys and marine propellors. Five sizes are available.



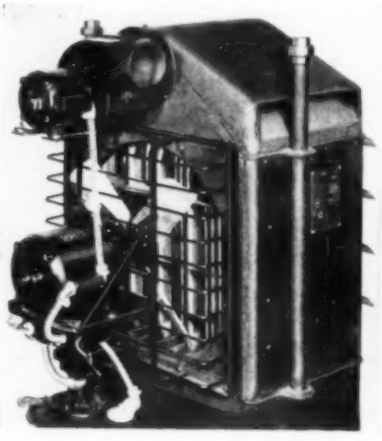
ADVERTISING PAGES REMOVED

Refractory

A. P. Green Fire Brick Co., Mexico, Mo., has developed a new castable refractory which it is claimed serves the double purpose of combining insulating properties with the advantages of castable refractories. The material is said to have a temperature resistance of 2500 degrees Fahr. and may be used in direct contact with flame up to that temperature. It matures without the application of heat and may be placed in service in from 12 to 24 hours.

Unit Heater

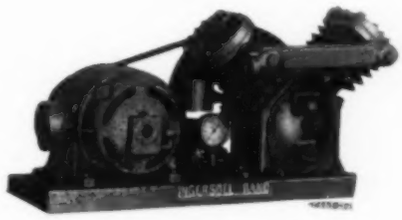
Automatic Gas-Steam Radiator Co., Brushton avenue, Pittsburgh announces a new series of five gas fired unit heaters ranging in capacities from 85,000 to 200,000 B.t.us. per hour and equipped with



automatic flues for venting products of combustion from interior of building. These heaters burn natural or artificial gas. The automatic flue has a motor and blower connected in such a way that when the heater starts, the flue automatically carries the products of combustion through pipe and wall to the outside. A safety pilot turns off the gas if the pilot goes out or burns too low. The unit also may be used for ventilating, cooling and drying. The unit is suspended from the ceiling. The gas fires into a combustion chamber and the products of combustion pass upward into a bank of tubes. Air is passed around the tubes by a motor driven fan located at the back of the unit.

Compressors

Ingersoll-Rand Co., Phillipsburg, N. J., has developed a new line of industrial compressors and vacuum pumps in sizes from ¾ to 5 horsepower. The new compressors, embodying a simplified finger valve construction, form only one part of a complete range built in sizes up to 15 horsepower for pressures up to 1000 pounds. They are available



with or without drive, receiver mounted, or bare. The company also announces a new line of paint spray compressor units which utilize the finger valve construction. Noteworthy features, as shown in the accompanying illustration, include heavy steel base, automatic pressure regulator, V-belt drive, crankcase breather, air cooled cylinders and heads, filter and muffler, gray iron cylinders honed and lapped, and centrifugal governor which automatically unloads compressor and prevents motor over load in starting.

Blowpipe

Linde Air Products Co., 205 East 42nd street, New York, is distributing a heavy duty welding blowpipe designed for welding and heating ranges above those within the capacity of the ordinary blowpipe. It is claimed the new pipe delivers a tremendous amount of heat to a localized area and does this so quickly that metal working and heat treating can be done at top speed. Extensions for the welding head are available for extra heavy work, thus doing away with the necessity for heat shields.

Cutting Torch

Modern Engineering Co., Pine boulevard, St. Louis, has placed on the market a cutting torch with three tube construction, monel metal tubes for maximum heat resistance and strength. All other parts are forged and extruded metals. The patented head mixer is claimed to provide a perfect mixture of preheating gases and allows for easy cleaning to prevent over heating. Connection of tip to head eliminates leakage between high pressure passage ways and to

other leaks that might endanger the operator. It is claimed that these features prolong the life of the tip. The high pressure oxygen valve is controlled by a long lever with a thumb operated locking device at the end. The needle valves equipped with tension springs provide for automatic take up against wear and assure accuracy of adjustment even where the torch is dropped accidently. All moving parts permit adjustment to provide for normal wear.

Factory Truck

All Steel Welded Truck Corp., Railroad avenue, and Eighth street, Rockford, Ill., has placed on the market an industrial type truck in which the deck presents a perfectly smooth surface, the sides are turned down and the platform is supported by from 7 to 10 steel channels, depending on the size. It is claimed this type of construction prevents deck sag under normal or heavy load. The unit is adaptable for use with a lift jack or as an ordinary truck equipped with cast or rubber tired wheels, roller bearings and pressure grease fittings. Casters are all steel, double row ball bearings with machined races. The trucks are available in a wide variety of sizes, with deck in 10, 11, or 12 gage steel. Standard sizes range from 24 to 48 inches to 40 x 72 inches.

Resist Rusting

Skybryte Co., 3125 Perkins avenue, Cleveland, has announced a new ready-mixed aluminum paint, specially formulated for painting rusted chain link fence without removing the rust. The base oils are of the penetrating type which creep into all joints and contact points sealing the rust against further corrosive action. It is said the paint dries from the outside retaining a firm elasticity which is able to withstand the movement of the joints without chipping, and it may be applied with brushes or spray gun.

Skull Guard

Mine Safety Appliance Co.; Braddock, Thomas and Meade streets, Pittsburgh, has developed a winter lining for the skull guard. A two-piece assembly of closely woven material, the standard size skull cap and lined ear lug section readily may be inserted in a hat or cap without alteration or change of size. It is claimed that the new lining is proof against wind, snow and rain and to offer comfort and snug fit for every wearer. It may be adjusted readily and easily through a simple snap fastener.

OBITUARY

ANDREW E. MENEELY, 54, president and secretary, Meneely & Co., Inc., Watervliet, N. Y., died at Cambridge, Mass., during a motor trip. Mr. Meneely began his business career in 1908 in the foundry established by his family more than 100 years ago and which manufactures bells for churches, shrines and carillons. In 1924 after the death of his father, he continued the business with his brother, Alfred C. Meneely. He graduated from the academies at Albany, N. Y., and Troy, N. Y., and Renasselaer Polytechnic institute, Troy.

* * *

Charles G. Zellmer, 53, stores keeper, National Malleable & Steel Castings Co., died in Cleveland, Sept. 7.

* * *

E. M. Tiller, president and general manager, Iowa Foundry Co., Sioux City, Iowa, died recently at his home in that city.

* * *

Otto Dunkel, sales manager, Kinney Iron Works, Vernon, Calif., died Sept. 10. Mr. Dunkel was a pioneer foundryman in Southern California.

* * *

Eugene Tetzlaff, 74, president and founder of the Flour City Ornamental Iron Co., Minneapolis, died recently in that city.

* * *

Julius F. Janes, 63, died recently in Cleveland. During the World war, Mr. Janes with his brother, Edwin H. Janes, headed the Standard Steel Castings Co., Cleveland.

* * *

W. Charles Panzer, 54, a native of Detroit, died in that city Sept. 5, after several years' illness. With his brother, George Panzer, he founded the Northwestern Brass, Bronze & Aluminum Foundry, Detroit.

* * *

John Allen, former foundry engineer, Cadillac Motor Car Co., Detroit, a member of the American Foundrymen's association, for many years active in foundry circles in the Detroit district, and lately retired, died Sept. 15.

* * *

Lawson H. Whiteside, Michiana Products Corp., Michigan City, Ind., died as a result of an automobile accident near Chicago recently. Mr. Whiteside joined the Rich Tool Co., Chicago, in 1912, which later was taker over by the Michiana Products Corp. He represented the organization as sales executive in the Chicago area for many years, and the past 4 years served as sales manager.

* * *

Benjamin Wilson, 58, since 1918 assistant to the vice president in charge of operations, American Car & Foundry Co., New York, died recently in that city. He had been connected with the company 40 years.

* * *

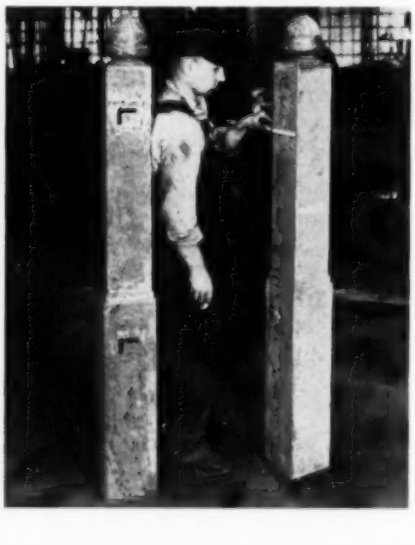
Ivan M. Bregowsky, 75, chemical and metallurgical engineer, died in Hollywood, Calif., Sept. 10. Mr. Bregowsky had been general manager of Grabler Mfg. Co., Cleveland, manufacturer of pipe fittings and accessories, until 4 months ago. During the World war he served as metallurgist, army ordnance department, Chicago.

* * *

Josiah M. Lasell, 75, president of the Whitin Machine Works, manufacturer of textile machinery, Whitinsville, Mass., died at his home in that city recently after an illness of nearly 2 years. Mr. Lasell was of the fourth generation of the family which settled the Whitinsville community and built the machine works. He attended Phillips academy and graduated from Williams college in 1880.

Fence Posts Made Of Cast Iron

Recent tests and experiments in Pittsburgh, according to Meehanite Research institute, have developed a new use for its cast iron in the form of fence posts for ornamental guard railings along bridge approaches, ramps and boulevards. Impact and tension tests meet required specifications. Test specimen withstood 3 blows of a 225-pound weight dropped 12 feet while tension test specimen ½ x 1½ inches from same castings showed a yield point of 41,300 pounds per square inch and an ultimate strength of 43,500 pounds per square inch.



Book Review

Medicolegal Phases of Occupational Diseases, by C. O. Sappington, M.D., Dr.P.H., 400 pages in cloth, published by the Industrial Health Book Co., Chicago, and supplied through THE FOUNDRY, Cleveland, for $2.75.

In this book the author has considered all of the aspects of the occupational disease problem as a whole including the measurement and evaluation of industrial exposures, interpretation and application of information relation to physical examinations, diagnosis, clinical laboratory work and X-ray findings; correlation of industrial and medical information in terms of cause and effect relationships; occupational disease legislation; case decisions of damage suits; commission hearings and review decisions; and insurance coverage. The material is divided into four parts, namely industrial, insurance, medical and legal.

The volume should have a place in the library of all types of industrial plants. The subject of occupational diseases is assuming an important place in the plant program, since the economic cost of occupational diseases has been found to be exceptionally important. A plant need not have an occupational disease exposure to have an occupational disease claim brought against it. The author is a consultant in occupational diseases and industrial hygiene and has prepared this book based upon his knowledge in the field, and the principles which have been evolved by the United States public health service, United States bureau of mines, Saranac Laboratory and other research groups and individual investigators.

Publishes Report

Clark Equipment Co., with plants in Buchanan, Berrien Springs, Battle Creek and Jackson, Mich., recently has incorporated its financial statement in a profusly illustrated book entitled, "President's 1938 Report to Employes." The book takes the financial statement of the company and reduces each item to a figure per employe. The text tells how much money the company receives per employe and what was done with the money. The report also pictures the plant, the product and manufacturing processes and pays tribute to its employes, especially the veterans.

MOLDING
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INTERNATIONAL MOLDING MACHINES
ARE INDISPENSABLE TO MODERN FOUNDRY PRACTICE. THEY INSURE MAXIMUM OUTPUTS, HIGHEST QUALITY OF CASTINGS AND LOWEST LABOR AND MAINTENANCE COSTS.
14 - Standard types for Cores
65 - Standard types for Castings
Many special types for work of unusual nature
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Knowledge Is Dangerous

(*Continued from page* 32)

solidification, and take the harmful, string like form and arrangement, classed as type 2. By the use of excess aluminum, and the consequent formation of considerable amounts of aluminum sulphide, solubility of the complex sulphides in the steel again is reduced, so that they precipitate early in the process of solidification, and take a relatively harmless form, classed by Sims as type 3. Amount of aluminum necessary to bring about that condition is from 0.075 to 0.10 per cent (1½ to 2 pounds per ton of steel), though in laboratory heats 0.05 per cent (1 pound per ton), sufficed.

Gagnebin's conclusions are similar to those of Sims and Dahle, with the exception that he advocates use of 0.10 to 0.20 per cent calcium in conjunction with 0.05 to 0.10 per cent aluminum, to secure the harmless random type of sulphide dispersion. In discussion, data were contributed by the operating executives group, division 1, Steel Founders Society of America, and many others, showing almost uniformly successful results from the adoption of the principles set forth by Sims. Briefly, the methods of acid electric furnace operation found by these men to be successful, may be summarized as follows: (1)—Use ore or scale with a charge so proportioned as to melt fairly high in carbon, and boiling vigorously. (2)—With more ore if necessary, continue the boil till carbon is reduced to about 0.10 per cent, silicon to about 0.05 per cent, manganese to about 0.08 per cent. Allow boil to taper off at these figures. (3)—Adjust carbon with low silicon pig iron, or washed metal. (4)—Build up slag either by sand addition or by absorption from the furnace bottom. (5)—Deoxidize in furnace with ferromanganese and ferrosilicon, when nearly ready to tap. (6)—Add at least 0.075 per cent aluminum (1½ pounds per ton), either by putting it in the bottom of the ladle and tapping the steel on it, or by wiring it to a rod and pushing it to the bottom of the ladle when full or nearly full of steel, but before the slag starts to run.

By the foregoing methods, which it is at once evident embody most of the principles advocated by Sims in 1932, with the additional use of excess aluminum, it is found that pinhole formation is prevented and low ductility heats are to a large extent avoided. Obviously this practice represents a reversion to the methods by which acid open-hearth steel has been made for many years. Oxidation and boiling, absolutely necessary in the open-hearth furnace to get the steel hot by proper circulation, followed by deoxidation in the furnace, thus are seen to have been of paramount importance in the production of nongassing steel that required little if any aluminum to produce scund castings.

As the writer pointed out a few years ago at an A.F.A. round table discussion on steel making, the principles thus briefly discussed have a very definite application to converter practice. Especially do they bear on the claim of inferior quality of converter steel, due to the oxidizing nature of the process, which was one of the leading arguments of those who banished the converter from decent company, as exemplified in A.S.T.M. specifications A95-36. Advocates of the inherently superior quality of electric furnace steel condemned the product of the converter as almost invariably of poor quality, while as a matter of fact much of the supposedly superior product of the electric furnace suffered from low ductility or aluminum embrittlement.

3—F. A. Melmoth, "Some Metallurgical Points on Acid Open Hearth and Electric Steel for Castings." *Transactions* of American Foundrymen's association, Vol. XXXIX, 1931, page 458.

4—*Transactions*, American Foundrymen's association, Vol. XLII, 1934, page 323.

5—C. E. Sims and F. B. Dahle, "Effect of Aluminum on the Properties of Medium Carbon Cast Steel." *Transactions*, American Foundrymen's association, Vol. XLVI, 1938, page 65.

(*Concluded on page* 86)

Table II

Chemical and Physical Properties of Converter Steel

Made at Plant of Whiting Corp., Harvey, Ill. Normalized Tests

Date	Blow	C.	Si.	Mn.	S.	P.	T.S.	Y.P.	Ext.	R.A.	Bend
4/23/38	CH	.27	.36	.70	.033	.04	74,940	43,890	33	56	
4/23/38	A70	.32	.38	.88	.030	.039	87,120	51,830	25½	41.6	

Table III

Chemical and Physical Properties of Converter Steel

Made at Plant of The Link-Belt Co., Chicago. For Specification Q Q S 681 a

Date	Blow	C.	Si.	Mn.	S.	P.	T.S.	Y.P.	Ext.	R.A.	Bend
8/3/37	37	.26	.35	.67	.030	.039	74,100	42,000	31½	59.4	OK
							73,250	42,000	31	58.3	
8/4/37	38	.26	.33	.67	.032	.034	71,100	40,000	32½	55.2	OK
							71,000	42,650	33	60.3	
8/5/37	39	.27	.36	.76	.027	.043	75,000	45,250	30½	49.8	OK
							76,000	45,750	30	51.4	
8/6/37	40	.34	.43	.70	.029	.029	75,500	42,500	32	50	OK
							76,000	47,500	29½	40.1	
8/9/37	41	.34	.43	.70	.031	.028	88,000	51,600	27	47.2	OK
							88,000	48,000	26½	46.3	
8/11/37	42	.30	.36	.72	.028	.029	81,000	48,250	30	56.2	OK
							82,000	47,000	30	52.8	
8/12/37	43	.30	.37	.71	.026	.038	81,500	46,500	27½	50.3	OK
							81,000	44,500	28	50.8	
8/13/37	44	.26	.36	.75	.031	.038	87,500	54,000	27½	50.0	OK
							87,000	47,500	26	43.4	
8/16/37	45	.28	.38	.67	.027	.037	75,500	43,500	33	54.1	OK
							75,250	43,500	29½	54.4	
8/17/37	46	.30	.39	.78	.040	.039	78,250	49,250	27	42.2	OK
							77,500	48,000	25½	42.8	
8/19/37	47	.29	.41	.70	.030	.039	78,250	46,000	29½	49.2	OK
							78,250	43,300	30½	53.3	

This TYPE W ROTO-CLONE does *DOUBLE DUTY!*

Because of its complete adaptability to all foundry dust problems, one Type W Roto-Clone may be found serving many operations—or only one . . . depending upon the size of the dust control job to be done.

Pictured below is a recent Type W Roto-Clone installation which was engineered to exhaust dust from tumbling mills by day and steel grit blasting operations by night.

The Roto-Clone was strategically located between the two operations and connected by a separate duct system to each. Many foundries have been able to handle all of their dust problems including sand screens, transfer points, elevator head, magnetic pulley, shake out, grinders, abrasive cleaning, etc. with one Roto-Clone where these operations are not too widely separated.

By day a Type W Roto-Clone exhausts dust from this battery of tumbling mills

By night the same Type W Roto-Clone exhausts dust from this steel grit blasting operation.

ROTO-CLONE®
WATER SPRAY
DYNAMIC PRECIPITATOR

Because of its ease of installation, its constant performance under all operating conditions, uniform air delivery while handling the heaviest dust loads, low operating cost, and adaptability to available space without disturbing normal foundry operations, Roto-Clone has set new high standards of economy in foundry dust control. Engineering data and literature will be sent on request. Ask for Bulletin No. 276.

AMERICAN AIR FILTER CO., INC.
Incorporated
218 Central Avenue, Louisville, Kentucky

AIR FILTRATION AAF DUST CONTROL

(*Concluded from page* 84)

6—A. P. Gagnebin, "Effect of Deoxidation Treatments on the Ductility of Cast Steel." *Transactions* of American Foundrymen's association, Vol. XLII, 1934, page 133.

This is the second of a series of three articles prepared by the author. The first appeared in the September issue and the concluding one will be presented in an early issue. The Editors.

Among Detroit Foundries

(*Concluded from page* 33)

the road thump to the body. Compressed fabric bushings with steel shells secure the inner ends of the lower suspension arms to the inner shafts, eliminating need for lubrication and seals and avoiding periodic replacement of rubber bushings.

Coil springs at the rear have larger inside diameter and are mounted above the axle. Torque tube, about 27 inches longer and larger in diameter, is bolted to the differential housing flange. Rear shock absorbers mounted on the brake backing plate instead of on the frame are cast iron parallel cylinder units and in the new location are as far out from the rotating center of the axle as possible, giving maximum control of axle movement.

Engine mountings are new, with 60 per cent more rubber than last year. Longer piston life and reduced oil consumption result from increased *land* dimension on pistons. Thickness of the top *land* has been increased 0.020-inch and the second *land* 0.010-inch, making possible the use of new compression rings.

Work Is Delayed

Chevrolet was delayed in getting started on 1940 models, mainly because of the strike of tool and die makers recently. Announcement date is Oct. 14, about a week after the new Ford lines will be introduced. Meanwhile, Pontiac, Olds and Cadillac will have released details on their new cars.

Among the so-called independent manufacturers, Packard and Hudson already have been commented on in this department. Willys is supplying two body styles in two series of cars for 1940, has redesigned front ends and improved engine performance by adding counter-balancers on crankshafts, revised carburetors, etc.

Nash has switched to coil springs on a new front suspension, making that type of springing standard on practically all cars. Ford and Willys, of course, are exceptions.

In equipment circles, Pontiac foundry has installed an airless abrasive blasting unit for cleaning rear axle parts. Chevrolet Gray Iron Foundry has installed a briquetting press for compacting borings for foundry use. Ford has installed further machines for airless blasting of tractor castings.

Magnesium Fabricators Inc., Adrian, Mich., a division of the Bohn Aluminum & Brass Corp., has announced it will shortly undertake plant expansion involving construction of building facilities four times the size of the present plant. Increasing demand for magnesium castings, especially from the aircraft industry, is explained as calling for greater production facilities in that plant, operations in which were described and illustrated in THE FOUNDRY for August.

Rising tide of orders for aircraft parts, is benefitting a number of other nonferrous foundries in this area, supplying bearings and structural parts. One adverse factor, however, has been the cropping up of strikes in Bohn Aluminum and Federal-Mogul plants in Detroit. Called by the UAW-CIO, these strikes have been in process for several weeks and up to press time had not been settled. Stoppage of production was said to be interfering seriously with the production plans of leading aircraft companies.

Adventures of Bill

(*Concluded from page* 52)

tice a ½-inch thickness of sand is placed in the bottom of the drag half of the corebox. The clay-washed arbor is placed in position and sand is rammed between the wings and up to the joint line of the box. A ½-inch rod is laid alongside each side of the central backbone to form vent holes. The second half of the corebox without any arbor then is filled with sand pressed down with the hands or with a light butt rammer. This part of the core must be comparatively soft, otherwise it will cause the metal to blow. The two halves of the core are booked, that is they are brought face to face in a vertical position and afterward lowered back on the floor or bench with the drag part underneath. The top half of the box is lifted off, or swung back on the hinges. The core is lifted out and placed in the mold.

"In a third method the same type of arbor is employed, but only one half of a corebox is needed, with a short section over the top at one end to form the bell. The half corebox is filled with sand as in the former instance. Then the top end piece is attached and sand is pushed in through each end. The remainder of the core is built up to slightly excess size with the hands. A semicircular strike riding on both sides of the half box is pulled from end to end to impart the desired shape to the top of the core.

"In conclusion," said Bill, "I directed his attention to the fact that articles on soil pipe manufacturing methods have been presented on many occasions in THE FOUNDRY. For example a long illustrated article on the methods and equipment employed in a prominent southern soil pipe foundry for making soil pipe and fittings appeared in the March 1, 1931 issue. I also pointed out that production of soil pipe castings is a highly specialized branch of the foundry industry. With an over production capacity in the United States it is claimed the selling price does not cover the cost of production. I am not familiar with the tariff regulations between the two countries on these castings, but I suggested it might be worth his while to get in touch with the nearest American producer and arrange to handle the product in his territory instead of incurring a headache trying to make the castings in his own foundry."

Chromium Cast Iron

Electro Metallurgical Co., New York, recently has published a 48-page booklet on the application of chromium in cast iron. Its title is "Chromium in Cast Iron" and the subject matter is divided into 14 sections covering various phases including metallurgical effects of chromium additions, production, effect on growth, resistance to oxidation and corrosion, effect on strength, hardness, wear resistance, machinability, heat treatment, etc. The booklet contains numerous tables and illustrations, and is a worthwhile addition to the foundry library. Copies may be obtained from the firm at 30 East Forty-second street, New York.

M. L. Erlenmeyer, Elmira, N. Y., the Boyer-Campbell Co., Detroit, and Berger Bros. Electric Motors, Inc., Rochester, N. Y., have been appointed distributors for T. B. Wood's Sons Co., Chambersburg, Pa.

You Too Can Cut Costs

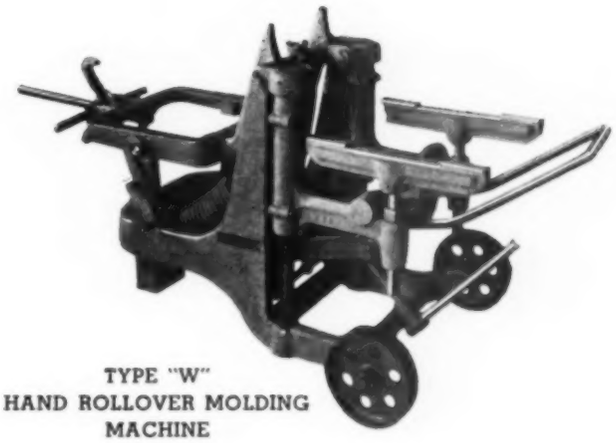
WITH THESE INEXPENSIVE FOUNDRY TOOLS

HAND RAM AND DRAW ROLLOVER MACHINE—A universal machine for either molds or cores. Various sizes of molds or cores can be produced profitable. Changing of jobs is simple and inexpensive. Can be used as a hand jolt.

Champion Hand Rollover Draw Machines are simple in design, adjustment and operation.

Steel castings are used where necessary. Guide posts are of GROUND AND POLISHED SHAFTING insuring accuracy and long wear. Maintenance cost is low.

Built in five sizes



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HAND ROLLOVER MOLDING
MACHINE

TYPE "R"
ELECTRIC SAND RIDDLE

THE CHAMPION ELECTRIC SAND RIDDLE has been endorsed by hundreds of users who say it is the best investment they ever made. Guaranteed to riddle more sand than any other machine within its size and price range. The operating cost is low. Requires no extra brackets or equipment, merely plug in the light current and put it to work. Will pay for itself in a short time.

SHIPPED ON TRIAL. ADVISE COMPLETE MOTOR SPECIFICATIONS, STATING VOLTAGE, CYCLE AND PHASE.

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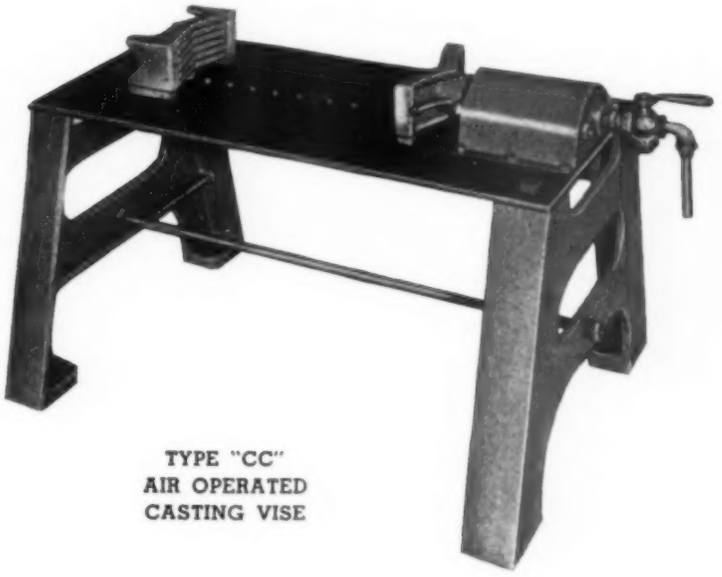
A low priced tool that should be in every cleaning room.

500 lbs. pressure holds castings absolutely tight and rigid when grinding or chipping and insures MAXIMUM SPEED, SAFETY AND EFFICIENCY.

Machine is of substantial construction with 3/8" steel plate table and cast steel jaws, designed to hold castings of all shapes. SHIPPED ON TRIAL.



TYPE "CC"
AIR OPERATED
CASTING VISE

Manufactured in Canada by John T. Hepburn, Limited—Toronto, Canada

CHAMPION FOUNDRY & MACHINE CO. 1316 West 21st Place CHICAGO, ILLINOIS

Fig. 5—At the left is the galvanized steel coil prior to assembly. The uncoated ends will be removed later. View at right shows coil assembled in oil-sand cores. Cope cover core has not been set as yet

Aluminum Melting Furnace

(*Concluded from page 24*)

tap-hole brick and burner inlet blocks are inspected and replaced if necessary. At the conclusion of the first year's operation the lining on the roof and sides had to be replaced. From experience gained during that time we were able to put in a lining that looks now as though it will be good for at least 2 years' service.

The foregoing statements outline the method of operation suitable to production at Servel Inc. Other methods will be used to fit different operating conditions. The one important item that will remain the same for all operating conditions is that of furnace atmosphere. Unless close attention is paid to that detail the advantages claimed for this furnace may not hold true.

To provide quality castings and prevent excessive loss of metal a neutral to slightly reducing atmosphere must be maintained by proper adjustment of the burner venturies. When adjusting the gas-air ratio in the burner we watch the core of the flame close to the burners and look for a color that is bright blue with a slightly greenish cast. To obtain maximum gas economy a small amount of back pressure must be maintained within the furnace to minimize heat loss. This is obtained by adjusting the area of the flue opening at the furnace.

Maximum gas setting on the burner supplies 2,500,000 B.t.u. per hour. During tests conducted shortly after putting the furnace in service we found that with 10,000 pounds of molten metal at pouring temperature in the furnace we could load in 1000 pounds of pig and scrap and in 15 to 20 minutes have the metal at pouring temperature again.

Book Review

A Manual of Foundry Practice, by J. Laing and R. T. Rolfe; cloth; 312 pages 5½ x 8½ inches; published by Chemical Publishing Co., Inc., New York; supplied by THE FOUNDRY, Cleveland, for $7.25.

This is the second edition of a work originally published in 1934. The authors J. Laing and R. T. Rolfe are connected respectively with John Hall & Son Ltd., Oldham, and W. H. Allen, Sons & Co., Ltd., Bedford, the first as works manager and the second as chief metallurgist.

In the preface to the first edition the authors claim that the motive for the present work was the deplorable lack of books dealing with foundry practice in a manner commensurate with the needs of the foundry executive and engineer of today. What the foundryman wanted was an account in one volume of modern British methods of production, embodying all details vital to successful practical operation, but not to be found in available text books.

Several book reviewers mildly criticized some of the items presented and suggested that the book did not quite fulfill it's promise. Exhaustion of the first edition in the comparatively short space of 3 years and the publication in America of a second edition would seem to indicate that the authors had a slight edge on the reviewers in their estimate of what foundry readers wanted.

In the new edition various omissions and deficiencies, particularly the treatment of nonferrous alloys have been dealt with more fully. Typically British touches here and there will cause the average American foundryman to lift an amused eyebrow. However, in the main the book is a valuable addition to the list of foundry literature with the subject matter presented under the following chapter headings: Principles of molding and coremaking; coremaking; molding tackle; molding technique; plate and machine molding; molding and running in relation to design; loam molding; metallurgy of cast iron; melting of cast iron; special methods of production; Chill and Malleable Cast Iron; Nonferrous Founding; Appendix and Index.

Union Carbide & Carbon Corp., New York, recently acquired all assets of the Bakelite Corp., New York.

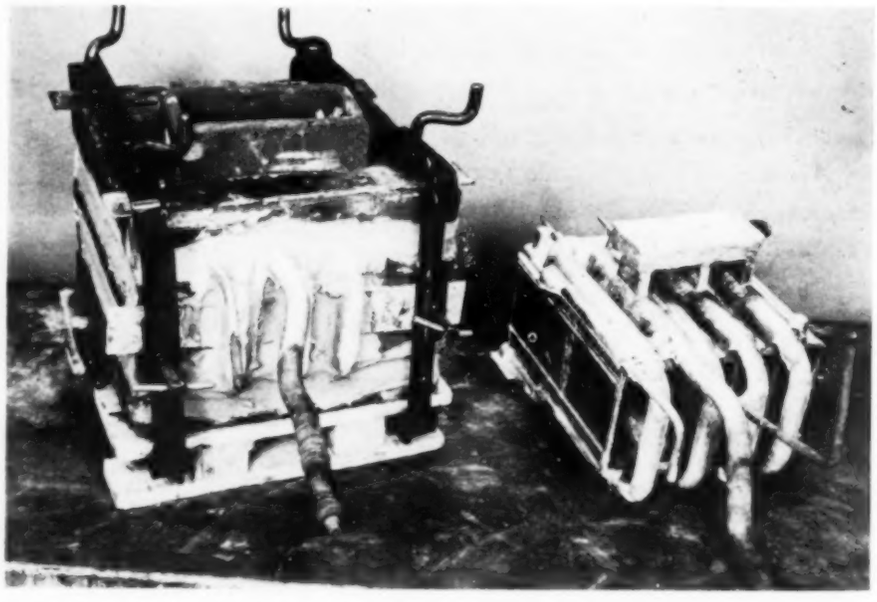


Fig. 6—Completely assembled, mudded and clamped dry sand mold ready for pouring is seen at left. Fireclay mud seals mold sufficiently that runouts are rare. At right is casting as it appears just after shakeout. Abrasive blasting will remove surface discolorations.

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THE NEWSPAPER OF THE METAL INDUSTRIES

Producing Aluminum Bronze

(*Continued from page* 26)

down to do the desired feeding.

Any discussion of aluminum bronze usually brings up the question of heat treatment, since it is an established fact that suitable heat treatment will enhance to a considerable degree some of the physical properties, but not all at the same time. Heat treatment is concomitant with exact knowledge of the composition of the specific alloy, and sufficient metallurgical training to understand thoroughly the use and application of the copper-aluminum equilibrium diagram.

Exact knowledge of composition is extremely important since variations in copper and aluminum content, not to mention additions of iron, nickel, manganese, etc., have a decided effect on heat treatment procedure. Hence, attention again is directed to the necessity of proper melting and molding to insure a uniform composition, high quality product. Another phase to be considered is the particular object to be attained by heat treatment since it hardly is to be expected that the maximum hardness, elasticity, and strength will eventuate from one specific procedure.

While considerable information has been published on the binary alloy containing only aluminum and copper with accurate data on the location of various solid solution phases in the form of an equilibrium diagram, the same unfortunately, is not true for aluminum bronze containing additional elements such as iron, nickel, manganese, etc. Hence, the following discussion of heat treatment is confined to the binary alloy containing only copper and aluminum, and based principally on the equilibrium diagram of Stockdale established in 1922-24, only slight modifications having been made by subsequent investigators.

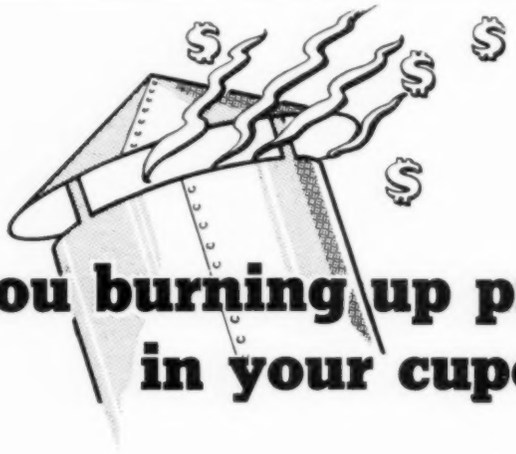
As may be ascertained from the accompanying diagram, copper-aluminum alloys containing up to 9.8 per cent aluminum under equilibrium conditions, consist entirely of alpha phase solid solution. However, under ordinary foundry conditions cooling rate is too rapid to permit equilibrium conditions, and alloys containing somewhat less than 8.5 per cent aluminum can be expected to show a duplex structure containing some beta or eutectoid instead of pure alpha structure.

Show Different Properties

Before going further it may be well to point out that the different structural phases have different physical properties, and it is by controlling as closely as is practicable the amounts of each phase, that the final desired characteristics are obtained in the alloy. As pointed out in a discussion published by H. Kramer & Co., Chicago, in the copper-aluminum alloys the beta phase is hard and strong but lacks ductility at room temperature. The alpha phase possesses good ductility, but strength and hardness are ordinary. The delta phase is brittle, and its precipitation during slow cooling of large castings has led erroneously to the term self-annealing.

Examination of the diagram shows that under equilibrium conditions an alloy containing 10 per cent aluminum and 90 per cent copper is completely solid at 1045 degrees Cent. (1913 degrees Fahr.), and will be composed only of the beta phase. That condition holds until a temperature of 850 degrees Cent. (1562 degrees Fahr.) is reached where

(*Concluded on page* 92)



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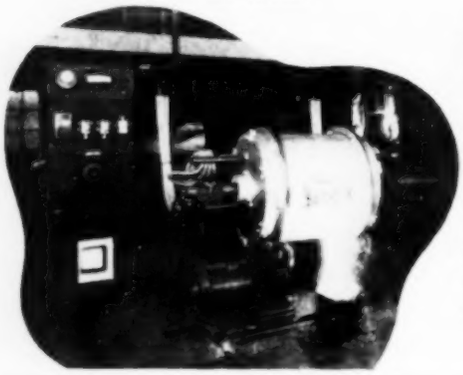

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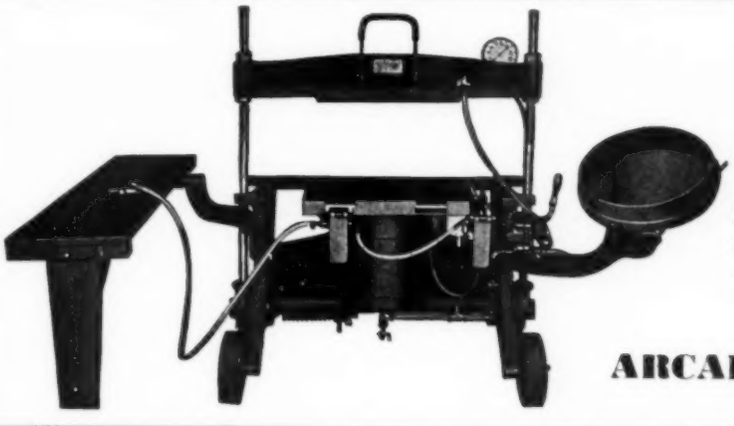

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(*Continued from page 90*)

the alpha phase begins to separate from the beta. As the temperature decreases more alpha constituent is formed until the temperature reaches 570 degrees Cent. (1058 degrees Fahr.) below which the eutectoid comprised of alpha and delta phases forms.

With that in mind it may be seen that essentially the heat treatment of aluminum bronze is to heat the alloy to any temperature between 1045 and 570 degrees Cent. (1913 and 1058 degrees Fahr.) wherein the structure consists of the beta or alpha-beta phases, and quench in water or other suitable medium. As indicated previously the temperature selected should be predicated upon what is desired as the predominating structure or phase, since between 850 degrees Cent. (1562 degrees Fahr.) and 1048 degrees Cent. (1913 degrees Fahr.) the beta phase which is hard and strong without much ductility at room temperature will result while between 850 degrees Cent. and 570 degrees Cent. (1058 degrees Fahr.) the alpha-beta phase will predominate.

Further heat treatment may be obtained by tempering or drawing at a temperature lower than that from which the alloy was quenched, but above 570 degrees Cent. Attention also should be called to the possibility of excessive grain growth induced by prolonged heating above the beta and the alpha plus beta solubility line where in extreme instances the cohesion between the beta grains is entirely destroyed. Limiting temperatures above which excessive growth may occur of course, vary with the composition but approximately are 700 degrees Cent. (1292 degrees Fahr.) for the 11 per cent aluminum alloy, and 850 degrees Cent. (1562 degrees Fahr.) for the 10 per cent aluminum alloy, as indicated by the sloping solubility line in the equilibrium diagram.

As pointed out in the beginning of this discussion, the information presented herein will apply only to the simple copper-aluminum alloys, and any addition of iron, nickel or manganese will necessitate a change in the temperatures mentioned. To give some idea of effect of heat treatment, work by Alkins and Cartwright in *Aluminum Bronze*, published by the Copper Development association, on extruded aluminum bronze rod shows that in general tensile strength of quenched specimens varies with hardness although appreciable departures from a definite relationship occur. The alloy used contained 89.87 per cent copper, 9.96 per cent aluminum, 0.21 per cent zinc, 0.04 per cent iron and 0.01 per cent manganese, and the results are shown in Table I.

Increase the Tensile Strength

In a booklet published by the British Aluminum Co. mention is made that the straight 10 per cent alloy heated to 850 to 900 degrees Cent. (1562 to 1652 degrees Fahr.), quenched in water and reheated to 625 or 650 degrees Cent. (1157 to 1202 degrees Fahr.), followed by slow cooling in the furnace increases the tensile strength from 73,900 pounds per square inch to 89,600 pounds per square inch; increases the yield point from 22,400 pounds per square inch to 47,000 pounds per square inch, decreases elongation from 21 per cent to 8 per cent in 2 inches, and increases brinell hardness from 94 to 175.

The outline previously given on production of aluminum bronze, and of castings in that alloy, essentially is a condensation of material published at various times. Some of the published data discussed the production of the alloy itself, and some were concerned with the method and precautions necessary for the molding of casting in that alloy and the aim has been to correlate and condense the published information available on this interesting subject in such a way that it would

(*Concluded on page 94*)

WHY DO ARMIES WEAR UNIFORMS?
The chance of an infantry attack to win, lies greatly in the ability of individual soldiers to abandon their own personalities and all act alike—each man doing the same thing! The uniforms of soldiers are symbols of this unity of purpose and action.
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Give Sloss Foundry Iron a try-out. A Sloss Shirt-Sleeve Service man will cooperate with your staff so you may benefit immediately from the advantages of Sloss Foundry Iron. Address inquiries to Sloss-Sheffield Steel & Iron Company, Birmingham, Alabama.
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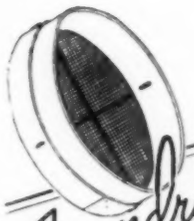

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HERE is a foundry riddle that will stand the "gaff" because it has been constructed and *designed especially for foundry use.* "Buffalo" riddles are noted for long life and the ability to do faster, cleaner work. It will pay you to try *Buffalo's* the next time you buy riddles.

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may urge repair with SMOOTH-ON No. 4

A RUSH order—hardly time to deliver the castings—and some of them come out of the molds with a few little sand and air holes in the surface. None impair strength, but some show up like a sore thumb.

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Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.

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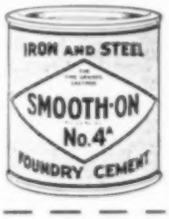

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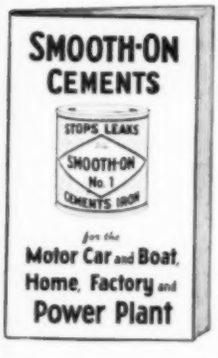

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(*Concluded from page 92*)

be of the maximum help to those interested in this problem.

Each manufacturer of castings in the high shrinkage alloys has his own preferred method of gating, his own theory regarding the placing and the size of the risers and his own practice regarding each and every step of production. However, the general principles which have been outlined will be found to be a part of the practice of all of different manufacturers. Consequently, individuals attempting to make castings in the alloys will find it necessary to follow the general principles. As they progress in production, special practices will be found preferable for adoption and those will depend primarily upon the same principles. The only difference is that such practices are peculiar to the individual foundry because of special type of equipment, or the particular type of casting to be produced. Furthermore, since heat treatment is affected to a considerable degree by variation in chemical composition, those who attempt to heat treat aluminum bronze without proper background of experience should not be surprised to find that a considerable amount of experiment and research must be completed before a uniform material, definitely reproducible, can be obtained.

Truscon Copper-bearing Steel Foundry Flasks are easy on the muscles. No needless weight *"muscles in"* to steal time and energy of molders. • Light weight and great strength of Truscon Flasks are obtained by deep ribs and flanges extending full depth all around. Made of copper-bearing steel, Truscon Flasks are durable and rust-resisting. • Send for your copy of the Truscon Flask Catalog which illustrates and explains all types of flasks designed for handling by one man, two men or by power equipment.

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Consider Means of Controlling Dust

A 25-page booklet entitled, "Silicosis Prevention—Dust Control in Foundries," recently has been published by the United States department of labor, division of labor standards. The discussion deals with methods of trapping dust at the shakeout, blasting units, tumblers, grinders, and mixing units, and sand conveyors; isolating dusty operations; good housekeeping; personal respiratory protection; foundry operating practices and administrative control.

The introduction points out that while this pamphlet deals only with dust control in foundries, it should not be inferred that the foundry industry offers the only or the most serious silica hazard. Copies of the booklet may be obtained from the superintendent of documents, Washington, for 10 cents.

Analytical Methods

Aluminum Research institute, 308 West Washington street, Chicago, recently has issued a second edition of its "Standard Methods for Sampling and Analyzing of Aluminum and Certain Aluminum Alloys." The book is 8½ x 11 inches and contains 31 pages describing methods for determining chromium, copper, iron, lead, magnesium, calcium, manganese, nickel, silicon, tin, titanium, and zinc. In this edition several of the methods have been revised, and some are new.

Safety Contest

Final report of the metals section eleventh safety contest, sponsored by the National Safety council, Chicago, indicates that foundries of the following companies operated from July 1, 1938 to June 30, 1939 without a lost time accident: James B. Clow & Sons, Coshocton, O.; Haynes Stellite Co., Kokomo, Ind.; National Cast Iron Pipe Co., Birmingham, Ala.; Lycoming Mfg. Co., plants Nos. 2 and 3, Williamsport, Pa.; Mackintosh-Hemphill Co., Midland, Pa.; James B. Clow & Sons, Newcomerstown, O.; American Rolling Mill Co. Inc., Central Works Foundry, Middletown, O.; Ideal Foundry & Machinery Co. of the Republic Steel Corp., Newton Falls, N. Y.; and American Rolling Mill Co. Inc., Sixth avenue foundry, Ashland, Ky.

Improvement in the foundry division during the past year over that of the previous 12-month period was 26 per cent as compared with an average of 19 per cent for all divisions represented in the contest.

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If your cleaning room is not among the hundreds that is using "American" it would pay you to write for further information.

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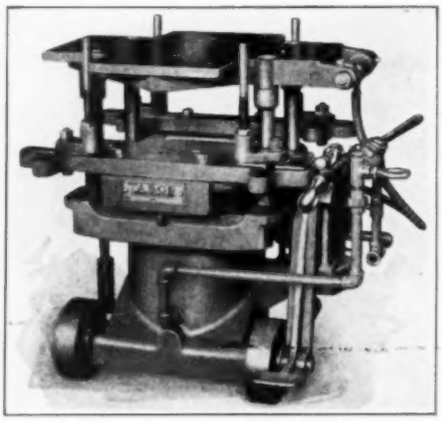

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Training Course at Rennselaer

(*Concluded from page* 27)

principle of spectrographic analysis and pyrometry.

Two hours per day in the last four weeks of the course were devoted to lectures and seminars on the malleable iron process from the practical and technical stand points. Remainder of each day was taken up by laboratory work and inspection of plants in the vicinity of Troy, N. Y.

Subjects covered in the class room and laboratory included: Design and operation of the air furnace, long and short annealing processes and annealing oven features, gating and heading in relation to shrinkage, molding, inspection, sand conditioning, mechanization and the various factors that affect scrap loss, different types of defects to which malleable iron castings are subject and methods of prevention.

Representatives of Whitehead Bros. Co., Albany, and H. W. Dietert Co., Detroit discussed sand conditioning and testing. Visits were paid to the Worcester works of the American Steel & Wire Co., Malleable Iron Fittings Co., Branford, Conn., Albany Car Wheel Co., Albany, N. Y., Allegheny -Ludlum Steel Co., Watervliet, N. Y., General Electric Co., Schenectady, N. Y., and molding sand pits in the vicinity of Albany.

In the opinion of the Malleable Founder's society and members of the school faculty directly engaged, those who took the course not only came into possession of information directly applicable to the every day practical problems of production but also have had opened to them avenues for further study. The latter applies particularly to those who have not had the opportunity of previous technical training.

Malleable iron manufacturers, users and the industry generally confidently anticipate direct benefit from the course of instruction. Great emphasis was placed on product betterment from the standpoints of intrinsic quality and uniformity. It is logical to assume that men returning to their various plants after such a highly specialized training course will exert a signally beneficial effect on the industry and the product. Indications point to a continuation of the practice of holding short educational courses from time to time.

"ALL SHAKE-OUT UNITS ARE *the same!*

Probably all this gent needs is some Carter's Little Liver Pills. For when the results are examined it becomes obvious that there's a whale of a difference between shake-outs. And that's why 95% of all shake-out units sold in the last four years have been Simplicitys.

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And there is plenty of evidence that the unique design and extra-sturdy construction of Simplicity units pays . . . one large Ohio foundry cut shake-out time 75% with a Simplicity. Another foundry that formerly required 80 man hours to clean a large casting now requires only seven minutes with an 8'x 10' dual Simplicity.

Simplicity Shake-Outs will pay in your foundry too. Write today for further facts. Also ask about our "free trial offer" on the efficient little portable sand units.

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Book Review

Dictionary of Scientific Terms, by C. M. Beadnell; cloth; 235 pages 5 x 7 inches; published by the Chemical Publishing Co., Inc., New York, and supplied by THE FOUNDRY for $3.00.

According to the introduction by the author this book of reference—for such it is intended to be rather than a dictionary pure and simple—is based on notations taken from recently published scientific books and from articles by recognized authorities in scientific periodicals. A bibliography of the majority of the authors is incorporated.

One of the unique features of the book lies in the numerous cross references, synonyms and antonyms to assist readers in quickly hunting up words of similar, related and opposite signification. The list includes over 2000 words and definitions. An interesting and valuable book of reference with only one minor flaw. No indication is given on how the words are pronounced properly.

Division of simplified practice, national bureau of standards, has published the fourth revision of simplified practice recommendation R45 on grinding wheels. Copies may be secured from the superintendent of documents, Washington, for 10 cents.

MORE WORK DONE IN LESS TIME WITH THESE *Lighter* CORE PLATES

● Production capacity takes a sharp rise when you use J-M Transite Core Plates. They weigh only one-quarter as much as metal of equal thickness . . . one foundry worker can easily handle twice the load. Cracking, breaking and warping are practically eliminated because Transite Core Plates are unusually strong and durable. And their tough asbestos-cement composition offers exceptionally high resistance to corrosion . . . assures longer life in any service. Why not get all the facts? Write for brochure PP-3A, Johns-Manville, 22 E. 40th St., New York, N.Y.

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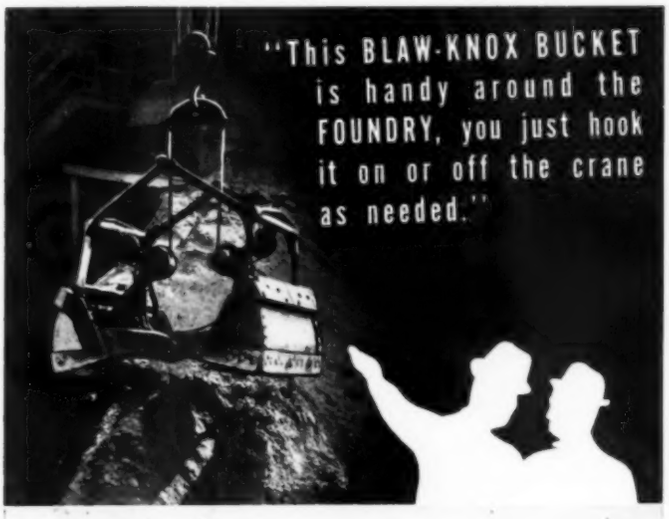

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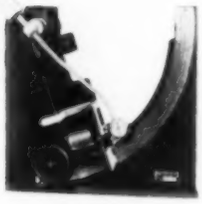
Prepare molding and core sands to predetermined moisture and permeability and save castings.

STRENGTH — DEFORMATION — FINENESS



Strength Machine

Sand Washer

Sieves and Sifter

Measure the strength and deformation of molding sand to determine workability. Control fineness for permeability and casting finish.

Carbon Determinator

MODERN ANALYSIS

Accurate carbon determinations made in two minutes with the Carbon Determinator.

Accurate sulphur determinations made in two minutes with the Sulphur Determinator.

Accurate spectrographic analysis of metals in eight minutes.

Speed up your laboratory to obtain chemical control that is in step with production. It will pay dividends immediately.

MOLTEN METAL TEMPERATURE

Ferrotemp

Accurate temperature determination of molten iron and nonferrous metal in ladles by immersion pyrometer. Range from room temperature to 3100° F.
Economical in cost and in use. Time required for reading is 45 seconds.

Write to us for

SAND TESTING — FERROTEMP — SPECTROGRAPH
QUICK CARBON DETERMINATOR — QUICK SULPHUR DETERMINATOR

HARRY W. DIETERT CO.
9330 Roselawn Ave.
DETROIT, MICH.

Control Cupola Combustion

(*Continued from page* 30)

within a cupola is almost entirely dependent upon the type and quantity of coke available in the combustion zone together with the amount of air used to burn it. By installing a pitot tube in the blast main and connecting it with a differential pressure recorder, a relative measure of the volume of air entering the cupola can be obtained. Correlating these data with a simultaneous record from the carbon dioxide recorder, a striking relation is found to exist.

With that simple means for measuring relative blast volume it is possible for the cupola operator to regulate the blast so as to compensate for changing conditions in the combustion zone and obtain both uniform and efficient cupola operation. Close relation between blast volume as measured by a pitot tube connected with a differential pressure recorder, and the carbon dioxide in the cupola gases is shown by two typical charts in Fig. 3.

These charts, from the same day's operation, consistently show that as the air volume increased the carbon dioxide concentration increased simultaneously. If changes in resistance within the cupola occur due to differences in density of the charge or variations in the rate of combustibility of the coke, the operator can vary the volume of air intelligently so as to obtain uniform combustion. These instruments rightfully can be considered the eyes with which the operator can see what is happening within the cupola.

Having established the benefits to be derived from these instruments, even with manual regulation of the blast volume, the further advantage from automatic control is readily apparent. A properly co-ordinated automatic control largely serves to eliminate the human equation and thereby permits attainment of a high degree of perfection with its attendant economies.

Measure Blast Volume

Automatic control of blast volume involves the use of a differential pressure controller actuated by a pitot tube in the blast main, which measures the relative volume of blast entering the cupola. The differential pressure controller in turn is connected electrically by relays to a reversing motor of sufficient torque to open and close a blast gate in the blast main. In addition, an added refinement has been incorporated, namely, carbon dioxide compensation.

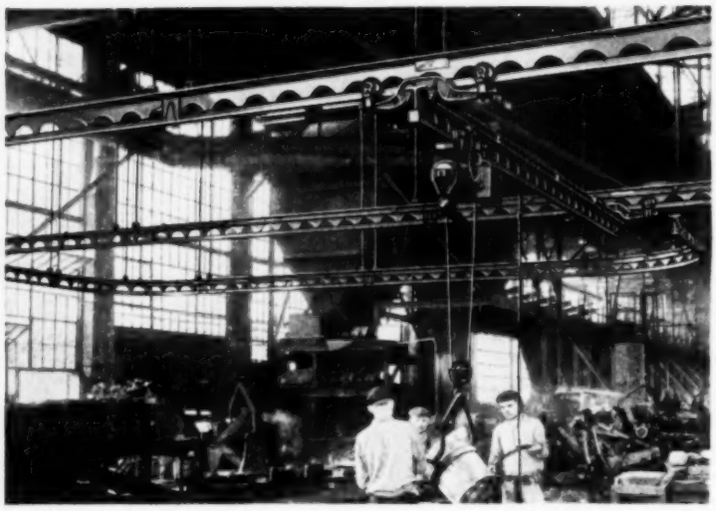
The carbon dioxide compensating mechanism is part of the carbon dioxide recording analyzer and is connected electrically to a small reversing motor which is part of the differential pressure controller. This motor in effect changes the nominal control point in the differential pressure controller to satisfy the changes of combustion within the cupola. It frequently occurs that even in the face of a constant blast volume, either excessive or subnormal carbon dioxide is produced representing either excessive or insufficient air to support the proper stage of combustion within the fusion zone of the cupola at that particular time.

Experience has shown that even with an automatic control which will deliver a constant volume of air to the cupola, a uniform stage of combustion is not maintained. Due either to variations in the rate of combustibility of the coke, coke size, or a number of other factors, a constant stage of combustion cannot be maintained unless the volume of air entering the cupola is

(*Concluded on page* 100)

CLEVELAND TRAMRAIL

OVER HEAD HANDLING EQUIPMENT



HANDLE LADLES THIS EASY WAY

● Hot metal is taken directly from the cupola to the pouring floor by this simple Cleveland Tramrail system and by means of the transfer bridge complete coverage is obtained without rehandling.

● Large and small foundries can be benefited by Cleveland Tramrail. Various type overhead handling systems are available— either hand power or electrified.

ALSO BUILDERS OF CLEVELAND CRANES ALL WELDED

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DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

1155 Depot St.

WICKLIFFE, OHIO.

Or Consult Your Phone Directory under Cleveland Tramrail

60-ton B-P Continuous Sand Muller.

SPECIAL FOUNDRY REPRESENTATIVE: GEORGE L. GRIMES, 1429 VIRGINIA PARK, DETROIT, MICH.

We believe you'll agree to this: The fact that one of the country's largest malleable iron foundries has installed their third Baker Perkins continuous sand muller is pretty good evidence of the efficiency and adaptability of these remarkable machines. B-P continuous sand mullers are now made in six sizes from 40 to 120-ton per hour capacity. They are the only mullers designed specifically for continuous sand conditioning.

If you are interested in speeding up sand handling in your foundry write for facts about Continuous B-P Sand Mixers or Batch Type Mixers for Laboratory or Production. Other Baker Perkins foundry equipment includes Automatic Flow Controls (for water or oil) and Sand Weighing Hoppers.

BAKER PERKINS INC. CHEMICAL MACHINERY DIVISION

SAGINAW, MICH. • NEW YORK CITY • CHICAGO • SAN FRANCISCO

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THE E. & G. BROOKE IRON COMPANY

◆

Manufacturers of

Basic, Malleable, Foundry, Forge and Low Phosphorus Pig Iron

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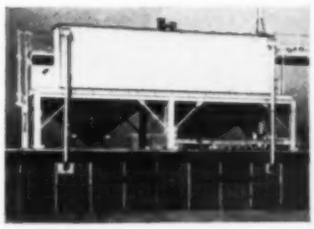
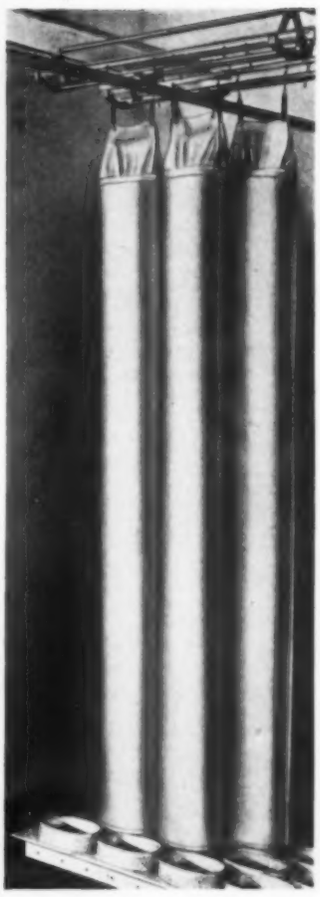
BIRDSBORO, PENNSYLVANIA

PARSONS *for Leadership in* **DUST CONTROL**

The Oval Bag Dust Arrestor will "clear the air" for you with continuous high efficiency — WILL NOT PLUG even when used with the most difficult shakeouts. *Write for bulletin.*



PARSONS ENGINEERING CORPORATION
CLEVELAND OHIO



(*Concluded from page 98*)

changed to meet these changing conditions within the cupola. If the blast volume is controlled so as to maintain a constant flow under normal conditions and can in addition be changed by means of carbon dioxide compensation as conditions in the cupola make it necessary, a practically constant stage of combustion will be produced at all times.

Typical charts obtained from the carbon dioxide and the blast volume recorders are shown in Fig. 6. From these charts it is apparent that where the carbon dioxide either rose above or fell below a normal concentration of approximately 13 per cent, the carbon dioxide compensating mechanism either decreased or increased the blast volume so as to return the cupola to the normal stage of combustion. Comparison with Fig. 5 which is a typical record of a good manually controlled operation indicates the advantages of automatic cupola control.

A photograph showing the complete group of instruments ready for installation in the foundry is shown in Fig. 3. Installation of this automatic control requires little modification of the cupola or existing air supply. After the instruments are installed, they must be adjusted to co-ordinate the control with the most desirable cupola operation. Experience has shown that this must be done during actual operation of the cupola to obtain the most satisfactory results. The equipment is extremely flexible and by the mere act of throwing a switch the cupola operator can change from automatic to manual operation.

The cost of the various component parts of this automatic control is less than $1,000.00 plus an additional installation expense which should not exceed $300.00 but is dependent upon conditions existing in the foundry. Although the initial investment might appear high, resulting coke economy with uniformity of composition and behavior of the metal melted will soon liquidate the original investment and thereafter yield a dividend.

The development of this control has extended over a period of approximately three years. A great deal of credit is due F. K. Vial, vice-president, for his insistence that the basic laws governing combustion were applicable to the cupola and that its consistently successful operation was entirely dependent upon them. Appreciation is due the other members of the research staff who assisted in this work and to the management of the Association of Manufacturers of Chilled Car Wheels for permission to publish the results of this research.

Stearns COOL

Because They're Ventilated

Magnetic Pulleys

are the choice of more and more foundry engineers

We are proud of being selected by leading engineering and equipment supply firms to furnish STEARNS Magnetic Pulleys and separators for foundry installations.

An indication of STEARNS prestige is the discerning number of manufacturers who prefer Stearns magnetic equipment year after year, in fact, our best customers are previous buyers.

Progress is born of experience and experience is your best protection. Stearns Magnetic set the pace in scientific magnetic pulley construction back in 1917 . . . Stearns Magnetic exclusively introduced the air-cooled magnetic pulley in 1922 . . . Stearns Magnetic has used the unit one-piece integrally cast magnet body since 1924.

The many new, exclusive and pioneer improvements built into Stearns magnetic products, their time proven construction, dependability and long life, economy of operation and low maintenance costs mean much to you.

Stearns Magnetic Pulleys provide a positive, automatic, time and labor savings method of reconditioning sand. Designed to fit into your conveying system and also available in complete portable separator units adaptable for sand slinger and many other uses.

Our Bulletin 301 on Magnetic Pulleys is yours. Write for it.

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SEPARATORS DRUMS ROLLS CLUTCHES BRAKES MAGNETS

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LARGEST EXCLUSIVE BUILDERS OF MAGNETIC EQUIPMENT

662 So. 28th Street Milwaukee, Wis.

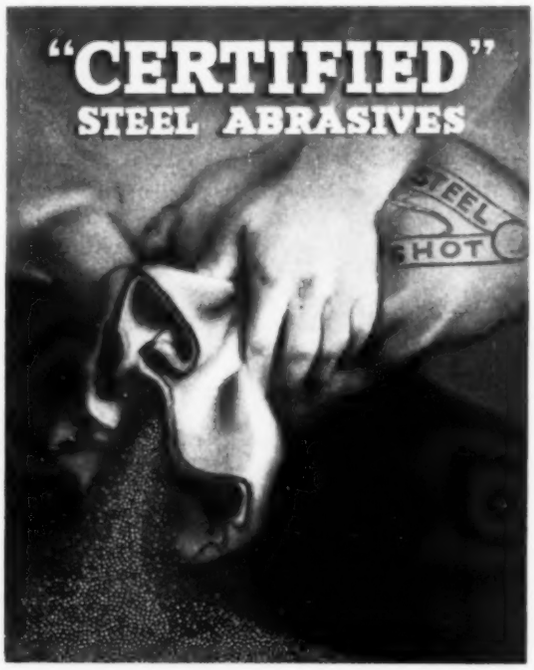
Book Review

Foundry Calculations and Drawings, by Leslie Booth, fabricoid, 133 pages 5 x 7½ inches; published by J. B. Lippincott Co.; supplied by THE FOUNDRY, Cleveland, for $1.50.

This book, one of a series of industrial textbooks, is designed to help the practical man, student and apprentice interested or engaged in foundry practice. It is intended to bridge the gap between practice and theory and to that end covers the elementary principles of mathematics, mechanics, sketching and drawing, graphs, weight estimating, calculating furnace charges and includes the necessary logarithms and other tables. The text is supplemented with 71 illustrations and a complete index.

If one might venture a mild criticism it is on the amount of space devoted to the subject of calculating crucible steel charges, since this branch of foundry practice now is practically obsolete. However, the basic principles are the same in calculating any type of metal charge and for that reason the information can be adapted.

Production of high grade ferromanganese has been started by Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.



HOW MUCH WORK . . . PER DOLLAR?

That's the only important question to ask when buying steel abrasives for your many blast cleaning requirements. For the brand *that does the most work per dollar* is your one best bet for profitable blast cleaning.

Fifty years of experience making and selling "Certified" Steel Shot and Grit qualifies us to answer the question. WE KNOW that "Certified" Steel Abrasives are the toughest, hardest abrasives on the market today. New processing developments have increased crushing strength approximately 40%—a *vital factor in economical blasting life!* Skeptical? Let us prove what we know are facts. No obligation or cost. Just write us for "Certified" Steel Abrasive data today!

PITTSBURGH CRUSHED STEEL CO.
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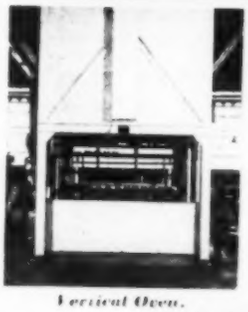
Look into CARL-MAYER advantages before ordering CORE and MOLD OVENS

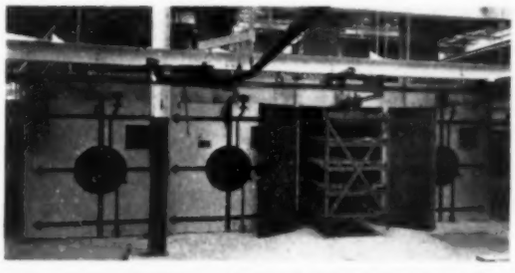
OVER 20 YEARS EXPERIENCE



Vertical Oven.

Many others have done this —that's why you'll find scores of users completely sold on Carl-Mayer ovens.

Write for literature and list of users.



Rack Type Ovens with gas or oil air heater.

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"Don't Accept A Substitute"

GOULAC

Carried in stock by the leading Foundry Supply Jobbers.

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General Offices:
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CARLOAD SHIPMENTS:
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FOUNDRY ACTIVITIES

SOUTHERN WHEEL CO. division American Brake Shoe & Foundry Co., 700 Sixth avenue, Birmingham, Ala., will demolish buildings on present site and erect new steel frame and corrugated building. Estimated cost, $100,000.

* * *

A sheet metal building 19 x 40 feet and costing approximately $2000, has been erected over the enameling oven at the plant of the National Enameling & Foundry Co., 1320 South Alameda street, Compton, Calif.

* * *

General Alloys Co., Boston, is casting an 8-ton stainless steel monument to news for the facade of the Associated Press building, New York. Plaque will be 17 x 22 feet. In flat but bold detail it will depict five supermen at work with modern facilities for collecting and disseminating news — camera, telephone, wire photo, teletype and pad and pencil.

* * *

Butler Street Foundry & Iron Co., 3424 South Normal avenue, Chicago, was damaged by a fire recently.

* * *

American Furnace & Foundry Co., Milan, Mich., has an addition to its plant under construction, which will be used for molding operations.

* * *

State Foundry & Pattern Co., 90 Elinor avenue, Akron, O., recently has been purchased by the Berted Foundry Co., Columbiana, O.

* * *

Piasa Foundry Co., East Albion, Ill., has been organized to operate a foundry and machine shop. Incorporators are F. E. Rhine, F. B. Rhine, J. B. Polster; J. E. Schlafly Jr., Alton, is correspondent.

* * *

Vancouver Iron & Steel Foundry Inc., Vancouver, Wash., whose plant recently was destroyed by fire, will erect a $10,000 building, and install equipment at a cost of $15,000 according to W. G. Hedge, president.

(*Concluded on page* 104)

No Sir! you don't gamble when you bake cores with MAEHLER CORE OVENS and HEATERS Results are Guaranteed!

A Maehler Engineer will help you select proper equipment for your problem — or show you how your present ovens can be improved with a Maehler Air-Heat System. Write for details today.

- All types of cores, large and small, thin and heavy section, can be baked at the same time—perfectly.
- Baking time reduced from 40% to 60%. More loads handled per day at much less cost per bake.
- Recirculated heat means absolutely even baking of all cores—no guesswork—no mistakes. Stack losses are low. Efficiencies are high. Hence we have shown again and again that we can burn the better fuels, with less overall baking cost.
- Oven temperatures are under automatic control at all times, maintained within 10°F. Once started the oven tends itself — it's foolproof — no fear of under heat or over heat.

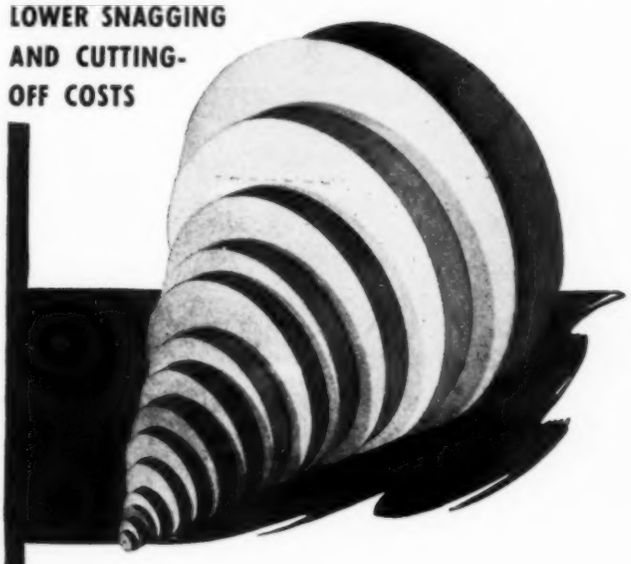
THE PAUL MAEHLER COMPANY, 2200 W. Lake St., Chicago, Ill.

RAW MATERIAL PRICES
Sept. 23, 1939

Iron	
No. 2 foundry, Valley	$23.00
No. 2 Southern Birmingham	19.00
No. 2 foundry, Chicago	23.00
No. 2 foundry, Buffalo	23.00
Basic, Buffalo	22.00
Basic, Valley	22.50
Malleable, Chicago	23.00
Malleable, Buffalo	23.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$5.50 to $6.30
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$14.75 to $15.25
Heavy melting steel, Pittsburgh, No. 2	19.50 to 20.00
Heavy melting steel, Chicago, Auto No. 2	14.50 to 15.00
Stove plate, Buffalo	15.00 to 15.50
Stove plate, Chicago	12.00 to 12.50
No. 1 cast, mchy., New York	13.00 to 13.50
No. 1 cast, mchy., Chicago	16.50 to 17.00
No. 1 cast, Pittsburgh	22.00 to 22.50
No. 1 cast, Philadelphia	23.00
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	21.00 to 21.50
Car wheels, iron, Chicago	18.00 to 18.50
Railroad malleable, Chicago	21.00 to 21.50
Malleable, Buffalo	19.50 to 20.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	12.25
Straits tin	68.00
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	13.25 to 13.50
Lead, New York	5.50
Antimony, New York	13.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	6.25

MANHATTAN ABRASIVE WHEELS

LOWER SNAGGING
AND CUTTING-
OFF COSTS



ENGINEERED for the task after careful study of conditions, Manhattan Abrasive Wheels grind accurately . . . wear evenly at high speed . . . to do your job at lowest cost. Consult our

ABRASIVE WHEEL DEPARTMENT

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HANNA PIG IRON

BRANDS: Buffalo, Detroit, Susquehanna

GRADES: Foundry, Malleable, Silvery, Ferro-Silicon

THE HANNA FURNACE CORPORATION
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OF NATIONAL STEEL CORPORATION
Buffalo Detroit New York Philadelphia Boston

Long Service

Proves the Economy of CURTIS COMPRESSORS

At first, it may be hard to tell which compressor to select. But after months of service, Curtis precision workmanship, rugged construction and efficient design prove their worth in freedom from repairs, low current consumption, and long periods of uninterrupted service.

This fact is being demonstrated every day in hundreds of plants where Curtis Compressors are in use. Some of the features responsible for this outstanding dependability and efficiency are:

- **PRECISION WORKMANSHIP** — Less wear, longer life, greater efficiency.
- **CENTRO-RING OILING** — Positive pressure. Only one moving part.
- **TIMKEN ROLLER BEARINGS** — Less friction—adjustable for wear.
- **CENTRIFUGAL UNLOADER** — For automatic no-load motor starting.
- **CARBON-FREE DISC VALVES** — Fully enclosed crankcase . . . All parts readily accessible . . . Vertical and V-type cylinders, saves floor space . . . Capacities up to 360 CFM.

SEND COUPON for our 28-page free booklet, "How Air Is Being Used in Your Industry." The coupon will also bring you service reports, full description and prices of Model "C" Compressors.

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1922 Kienlen Avenue, St. Louis, Mo.
Gentlemen: Please send data on Model "C" Compressor, and your booklet, "How Air Is Being Used in Your Industry."

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Name _____ State _____
City _____

(*Concluded from page* 104)

Plans by D. W. Hillborn, Vancouver.

* * *

American Brake Shoe & Foundry Co., 1673 Bailey avenue, Buffalo, and 230 Park avenue, New York, proposes an addition to its plant at Buffalo, costing $40,000.

* * *

Index of foundry equipment orders for August, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 131.4 as compared with 111.9 in July, and 83.3 in August, 1938. Index of shipments was 143.8 in August as compared with 135.5 in July and 89.1 in August, 1938.

Trade Publications

ALLOYS—Ajax Metal Co., Philadelphia, recently has issued a booklet on its Bull bearing alloy, developed for excessive speeds, pressures and presses which combine to make the maximum in the mechanical severity.

CASTINGS—McKinnon Iron Works Co., Ashtabula, O., has issued a booklet illustrating the castings and machinery made by that company for boats on the Great Lakes.

WELDING ELECTRODES—McKay Co., York, Pa., has issued a 16-page booklet describing the certification process of weld deposit analysis and the welding procedure for various stainless steels.

FIRE BRICK—Ironton Fire Brick Co., Ironton, O., has issued a folder discussing the manufacture of the company's fire brick and explaining its long wearing qualities.

MOTORPUMP—A motorpump recently introduced by Ingersoll-Rand, 11 Broadway, New York, is described in a folder issued by that company. The folder shows the complete motor and also illustrates construction details.

MARKING DEVICES—M. E. Cunningham Co., 115-117 East Carson street, Pittsburgh, has issued a folder describing a new tool for marking curved surfaces. Other types of stamping devices are illustrated and described.

ELECTRIC FURNACES—Ajax Electrothermic Corp., Ajax park, Trenton, N. J., has issued bulletin No 12 illustrating and describing its small electric furnaces for laboratory work and lists refractories and crucibles to be used with them.

AIR HEATERS—Despatch Oven Co., Minneapolis, has issued bulletin 74, of 8 pages, illustrating and describing its indirect air heaters. Principles of construction, applications and specifications are included.

LIGHTING — Cleveland Electric Illuminating Co., Public Square, Cleveland, has issued a booklet listing the reasons for various Cleveland industralists and business men for improving the lighting in their establishments.

POWER TRANSMISSION—Bulletin 75 of 12 pages, issued by the Morse Chain Co., Ithaca, N. Y., gives data on the round pin roller chain, silent chain, also the various clutches, couplings and universal drives manufactured by the company.

BRONZE BARS—Johnson Bronze Co., 310 South Mill street, New Castle, Pa., has issued a novel catalog, shaped as a bronze bar, which contans the lists of cored bars and solid bronze bars carried in stock. Sales offices and warehouses of the company are given.

LAMP HANGERS—Thompson Electric Co., 1101 Power avenue, Cleveland, has issued catalog No. 39 covering its lamp lowering hangers, lamp shock absorbers, and accessories. Construction details are illustrated as well as the various types of lamp lowering hangers.

ELECTRIC DRIVE—Reliance Electric & Engineering Co., Ivanhoe road, Cleveland, has issued a 6-page folder describing its all electric adjustable speed drive for alternating current circuits. Illustrations point out construction details and their application.

ILLIUM—A 6-page booklet prepared by the Burgess-Parr Co., Freeport, Ill., describes the corrosion resistant alloy illium. Physical properties, fabrication characteristics, the materials to which it is corrosion resistant and the products in which it is available are listed.

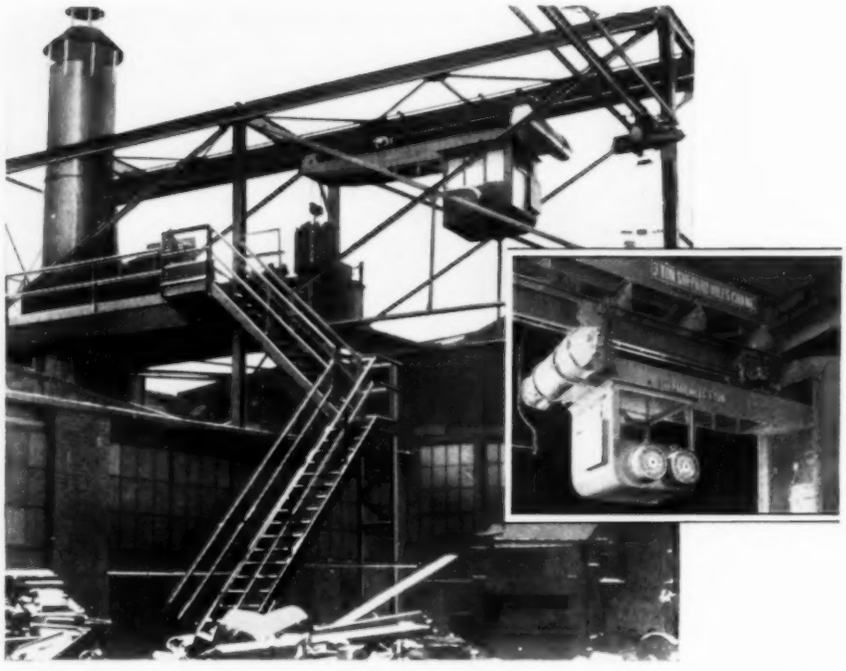
PULLEYS—Rockwood Mfg. Co., Indianapolis, has issued price list No. 860 on its line of paper pulleys, both those carried in stock, and those made to order. It also illustrates the various type

(*Concluded on page* 106)

Copies of any of the literature listed here may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

BETTER CASTINGS AT LESS COST PER TON

... with SHEPARD-NILES CUPOLA CHARGING HOISTS

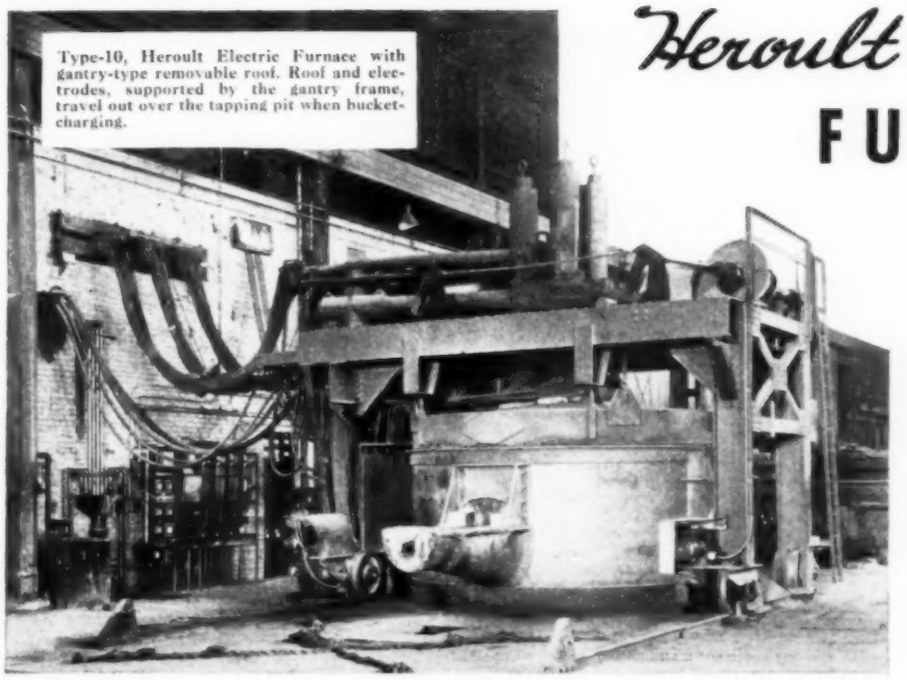


● Each charge is lowered in place, not dropped. Uniformly layered charges insure more even distribution of heat. Expensive charging floors are eliminated. Cupolas are charged faster and with fewer men LESS cost per ton.

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

360 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.



Type-10, Heroult Electric Furnace with gantry-type removable roof. Roof and electrodes, supported by the gantry frame, travel out over the tapping pit when bucket-charging.

Heroult ELECTRIC FURNACES

AMERICAN Bridge Company offers an improved series of Heroult type electric furnaces especially designed for effective melting and refining of ferrous materials, and particularly suited to produce high-grade alloy and stainless steels, iron or steel castings.

Heroult Furnaces are sturdily built, and equipped with the most modern electrical and mechanical appliances for efficient, economical and safe operation. Dependent on size and operating conditions, they are adaptable to hand, chute, machine or overhead drop-bottom bucket charging. Available capacities range from ½ to 100 tons.

You are invited to call freely upon the specialized experience of our furnace engineers.

AMERICAN BRIDGE COMPANY

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Offices in New York, Philadelphia, Chicago and other principal cities.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
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UNITED STATES STEEL

It's New!

"INTRODUCTION TO THE STUDY OF HEAT TREATMENT OF METALLURGICAL PRODUCTS"

By Albert Portevin

246 Pages . . . 69 Illustrations . . . 4 Tables . . . 6 x 9 inches . . . Cloth Bound . . . $5.00 Postpaid *

Fundamental knowledge and essential principles of heat treatment of steel are presented in simple and understandable manner. Albert Portevin, distinguished French physical metallurgist, has prepared this book without formulas. It is neither an encyclopedia nor a text book. Ideas and direction for understanding and interpreting metallurgical phenomena and solution to difficulties actually encountered in heat treatment of various products are thoroughly discussed.

Research engineers, metallurgical students and steel plant metallurgists, as well as others engaged in metallurgical investigation and the heat treatment of ferrous and nonferrous metals will find this book of inestimable value.

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CONTENTS

Chapter I—Transformation Points of Steel.
Chapter I-A (Supplementary) — Experiments and Examples.
Chapter II—Preliminary Treatment of Steel.
Chapter II-A (Supplementary) — Experiments and Examples.
Chapter III—Phenomena and Mechanism of Steel Quenching.
Chapter III-A (Supplementary) — Investigation of Hardened Steels.
Chapter IV.—Quenching.
Chapter IV-A (Supplementary) — Determination of Hardening Capacity of Steel.
Chapter V—Tempering Quenched Steels.
Chapter VI — Classification of Industrial Steels.
Chapter VI (Supplementary) — Experiments and Examples.
Chapter VII—Annealing.
Chapter VIII — Malleabilization of Cast Irons.
Chapter IX—Heat Treatment of Light Aluminum Alloys.
Chapter X—Heat Treatment: General Remarks.

The entire book is cross-indexed for easy reference.

**Orders for delivery in Ohio should include 15c additional for compulsory 3% sales tax.*

(*Concluded from page* 104)

of pulleys available for different types of work.

CEMENTS—Bonding materials, high temperature cement, fire clays, and furnace patch manufactured by the North American Refractories Co., National City Bank building, Cleveland, are described and their uses listed in an 12-page bulletin, No. 102, recently issued by that company.

THERMOCOUPLES—A 36-page illustrated bulletin has been released by the Foxboro Co., Foxboro, Mass., to describe its thermocouples and accessories. It includes descriptions of various types of thermocouples, assemblies and parts made by the company, also diagrams illustrating methods of installation.

ELECTRIC FURNACES—In bulletin No. 13, prepared by the Ajax Electrothermic Corp., Ajax park, Trenton, N. J., equipment for inductive heating without melting is described. Heater construction is explained as well as types of high frequency supply generator operated heaters.

CORE MACHINE—American Foundry Equipment Co., 558 South Byrkit street, Mishawaka, Ind., recently issued a folder describing and illustrating its stock core machine for cores from ⅜-inch to 3 inches in diameter and also describing its core rod straightener and shear machine.

NICKEL ALLOYS — International Nickel Co. Inc., 67 Wall street, New York, has published a new edition of the "Nickel and Nickel-Base Alloys . . . Their Use in the Design of Corrosion Resistant Machinery and Equipment." Text has been enlarged, tables and curves revised to include latest available information.

BUCKETS—Hayward Co., 50 Church street, New York, has issued bulletin No. 696 illustrating and describing buckets of all sizes for rehandling both light and heavy materials. Buckets are designed for carrying large loads and digging hard materials, others are designed for digging light materials from their natural state.

ALLOY STEEL AND IRON—International Nickel Co., 67 Wall street, New York, recently has made available a 4-page folder entitled, "Typical Nickel Alloy Steels and Irons Employed in Diesel Engine Construction." Information is given on compositions, mechanical properties and applications of typical nickel alloy cast irons and steels employed in diesel engine construction.

EMPLOYE RELATIONSHIPS—Metropolitan Life Insurance Co., Policyholder Service bureau, 1 Madison avenue, New York, has published the results of an interesting survey under the heading, "More Information for Employes Regarding Their Company." The report presents information on method used by approximately 160 companies to inform employes concerning the company and its problems.

FINISHING—"Superfinishing" is the title of a 5-page folder published by the Norton Co., Worcester, Mass., and describing and illustrating machines, stones and wheels, giving specifications on various applications. The company also has issued a 75-page booklet "Facts About Grinding Wheels." Part one covers grinding and grinding wheels; part two reference tables, wheel selection; and part three general grinding information.

ENGINEERING DATA BOOK—Manhattan Rubber Mfg. division, Raybestos-Manhattan Inc., 94 Townsend street, Passaic, N. J., has published an engineering data book for designers and engineers designing V-belt drives, which is divided into two parts. The first covers standard drives, eliminating the necessity of working out calculations, and the second, sheave factors for designing new or special drives.

PYROMETERS—C. J. Tagliabue Mfg. Co., Park and Nostrand avenues, Brooklyn, N. Y., recently issued a catalog containing descriptions of its indicating controller, indicator with an in balance signal, recorder controller for throttling fuel heat, one for throttling electric heat, two point indicating controller, multiple point indicating controller and cabinet type indicator. Instruments are illustrated as well as construction details and specifications given.

ADVANCEMENT — Ajax Electrothermic Corp., Ajax park, Trenton, N. J., has compiled a series of articles as presented by *Electrified Industry* illustrating and describing recent developments in the use of Ajax furnaces by various industries in the United States. Also a series of advertisements, which have appeared in scientific publications illustrating some of the applications the electric furnace in laboratory research work, have been assembled in booklet form.

CASTINGS — Electric Steel Castings Co., Speedway, Indianapolis, has included in one folder six bulletins the first describing the layout of the shop buildings, the second showing interior foundry views illustrating the company's foundry practice. The third bulletin discusses the manufacture of steel castings and the design and use of steel castings while the fourth points out construction features. The fifth bulletin deals with specifications and the sixth covers the wide range of castings manufactured by the company.

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